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FOUNDED IN 1896

BY

MAX A. GOLDSTEIN M.D.

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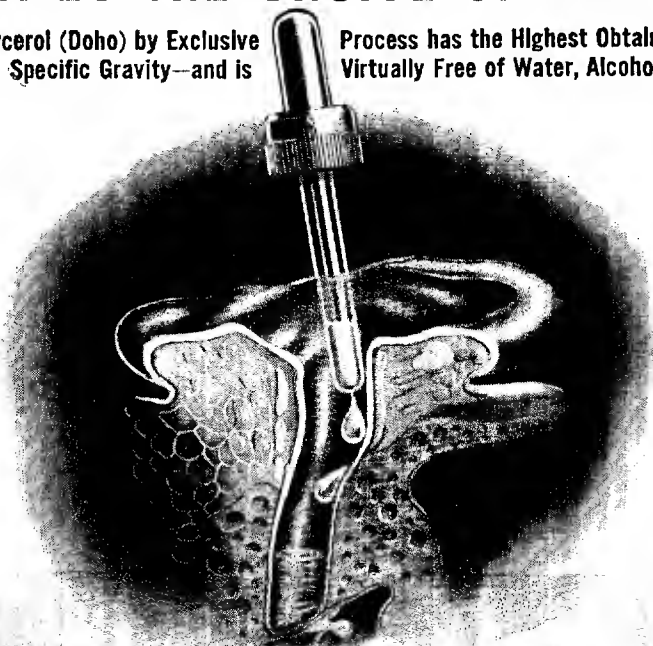
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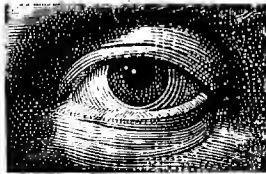
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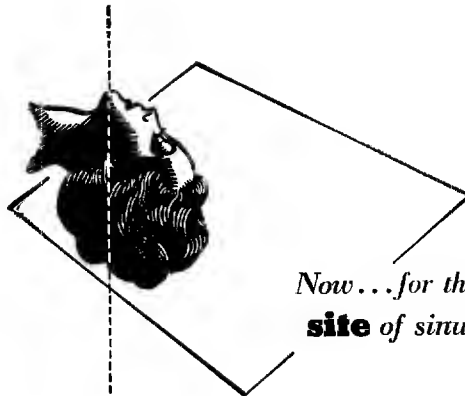
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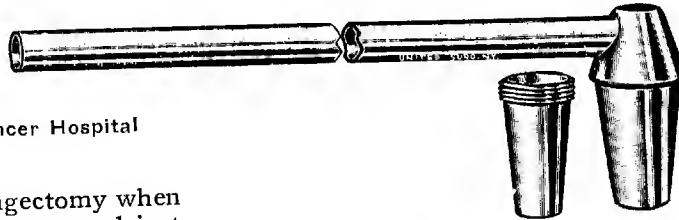
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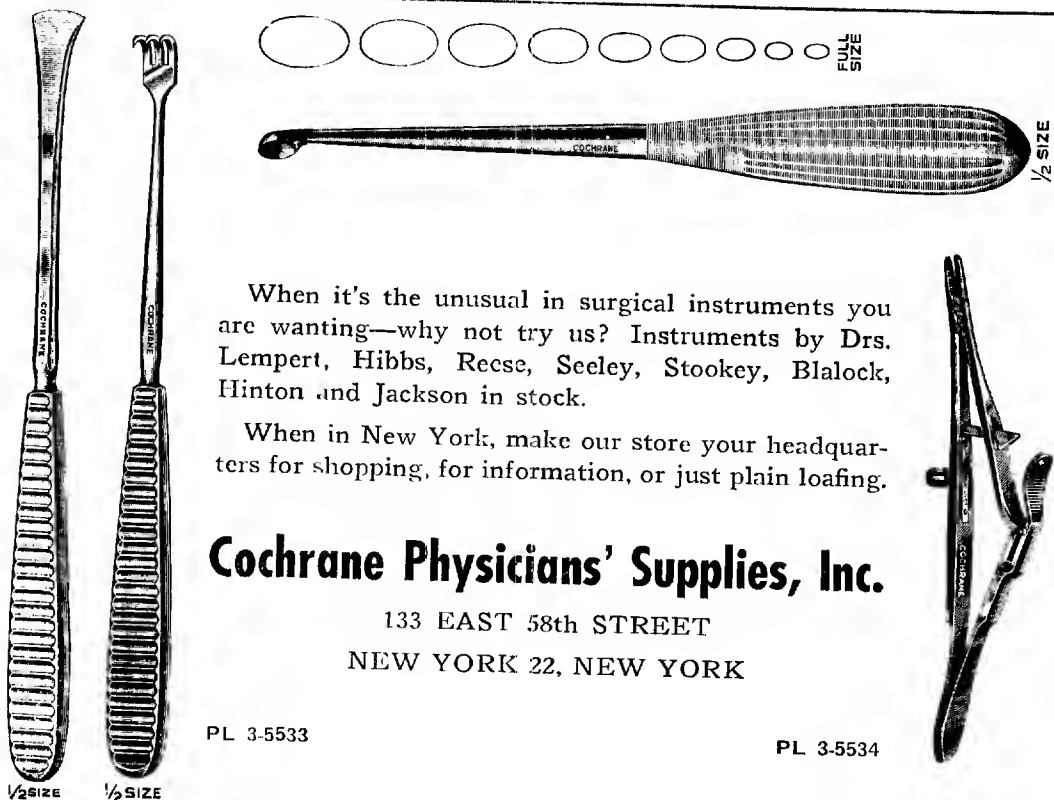
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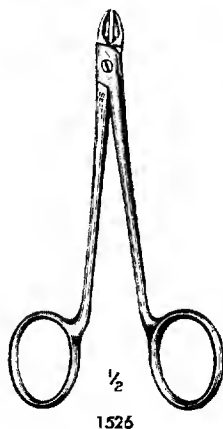
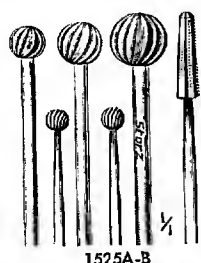
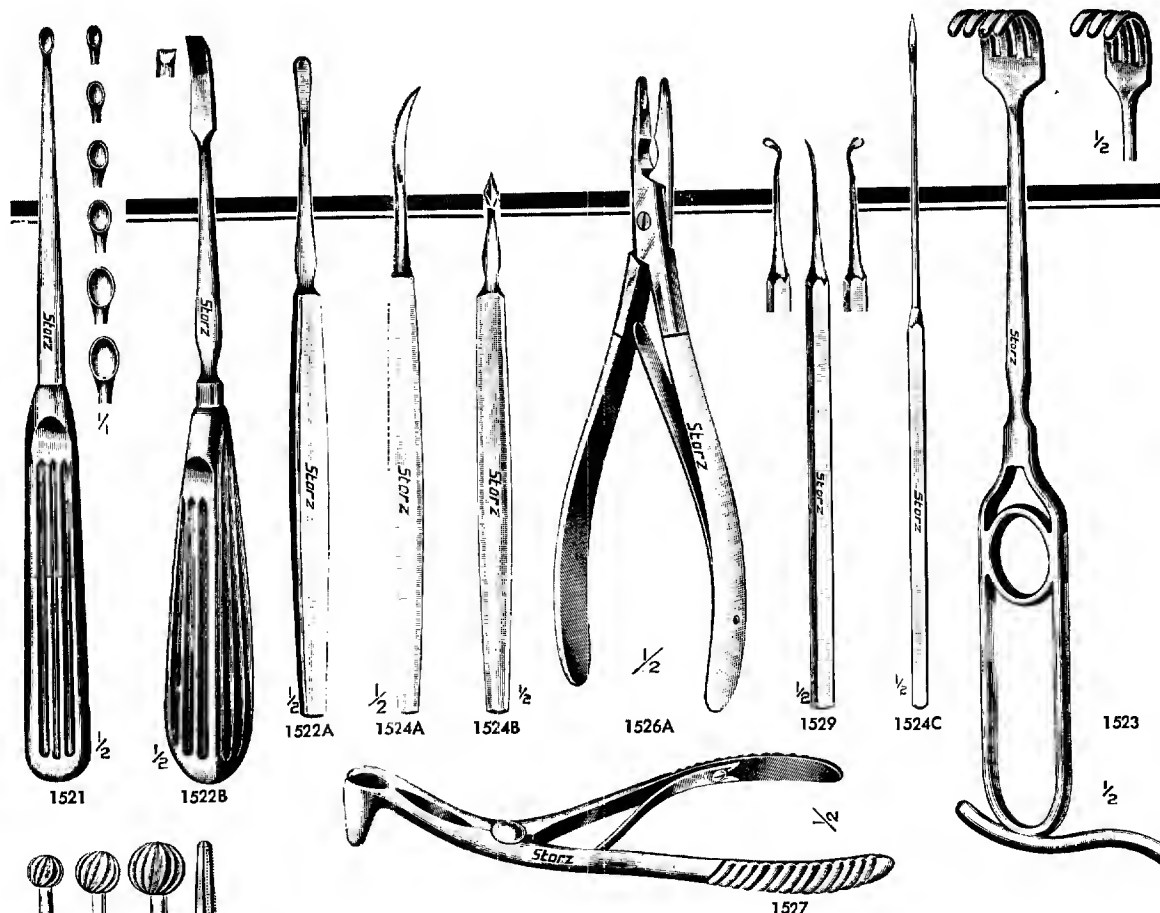
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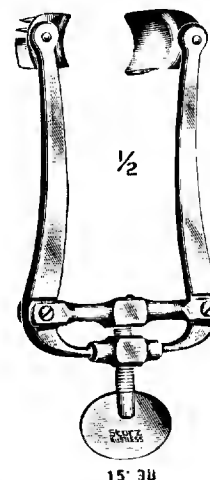
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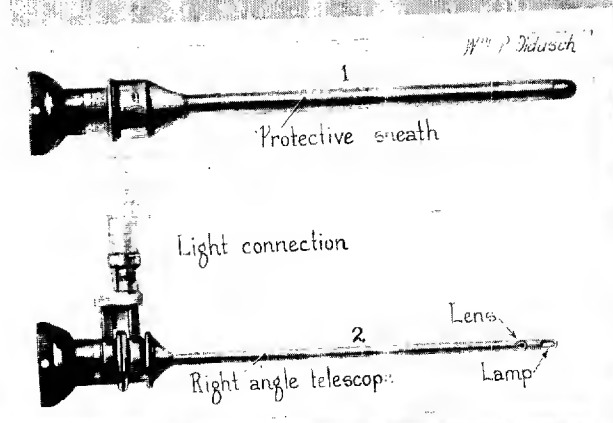
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VOL. LIX

SEPTEMBER, 1949.

No. 9

**RHINOLOGY IN CHILDREN, RESUME OF AND
COMMENTS ON THE LITERATURE FOR 1948.**

D. E. S. WISHART, M.D.,
Toronto, Canada.

The outstanding event of the year under review is the commencement of the experiment of medicine as a planned economy in Great Britain. In America forces are working toward a similar experiment. The paucity of articles on rhinology in children from across the Atlantic is extreme; is this one of the unforeseen effects of the new scheme? In America, there is very little in the special journals to show that thought is being given as to what the effect of the impact of the arrangement will be on our specialty.

The articles strictly limited to our subject in our own journals are none too many. Some leave the impression that the scientific quality of medical practice is in some way dependent on the part played by the laboratory. Some show too great a reliance on technique. Some show a reverence for a large bibliography. A deficiency of critical attitude is general. On the whole, your reviewer is struck by a lack of evidence of intellectual effort. To offset these impairments, articles closely related to our subject have been included, and wherever pos-

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sible articles showing divergency or disagreement have been placed close together. The same journals have been covered as in previous reviews, and the same order of discussion has been followed.

GENERAL ARTICLES - HEAD COLDS.

In reply to a correspondent¹ who asked if it would be permissible to attempt to reduce the incidence of severe head colds in a child, aged five, in whom no pathological cause can be found in the ears, nose or throat, by giving small daily doses of sulfadiazine throughout the winter, the *British Medical Journal* replied as follows:

The most likely etiological agent of the common cold is a virus, consequently the use of sulfadiazine would not be justified as a prophylactic measure. There would seem to be three possible causes for the trouble: first, there may be a chronic carrier (*i.e.*, old sinus trouble) in the family. Recurrent upper respiratory tract infection in children is sometimes cured by taking out father's tonsils! Second, the child may have some pathological condition which has been missed, such as antral infection. Third, associated with both of these, immunity may be low and might be stimulated by the use of a suitable vaccine and by general measures such as a full vitamin dosage, fresh air and attempts to harden the child. The possibility of an allergic rhinitis should not be overlooked.

The *British Medical Journal*,² in an annotation on oral penicillin in children, states that an important question in connection with penicillin treatment is the extent to which oral administration is justifiable. Against the single advantage of convenience must be set its extravagance, the dose required being at least five times greater than that injected, and the grave disadvantage of marked irregularity of absorption. All observers who have carefully studied its effects have noted that absorption varied widely from case to case, with the result that in any series of patients some will inevitably absorb only inadequate quantities of a dose which will suffice for others. Infants and children are naturally less tolerant of

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injection and require oral doses on a less extravagant scale. Two years ago, Buchanan suggested that infants under six months should absorb penicillin better than older children and adults because of the low HCl content of their gastric juice, and her own observations on 25 babies supported this. Satisfactory blood levels were obtained by adding penicillin to foods in amounts equivalent to a daily dose of only 4,000 units per pound (454 gm.) of body weight.

Various authors have reported favorably on the treatment of acute infections in young children with oral penicillin. Two publications on this subject from the United States tend rather to emphasize the limitations of this method than to acclaim its efficiency. Reisman and his colleagues treated 22 children, most of whom had upper respiratory tract infections, with large doses of oral penicillin, from 50,000 to 1,000,000 units being given every hour by day and every two hours by night. The results were "fair" in 12 patients; in the remaining 10 there was no apparent effect. In the majority no penicillin was detected in the blood, which is surprising in view of the amounts given, but this may perhaps be explained by irregular administration: Case 4, for instance, receiving "1,000,000 units every hour while awake and every two hours while asleep" for five days, is stated to have had a total dose of only 7,800,000 units — an unexplained discrepancy. The patients' ages are not stated, and there are no bacteriological data. Possibly some of the infections may have been caused by insusceptible organisms. The more valuable part of this paper is a study of absorption after oral administration; this again emphasizes what many previous authors have observed, namely, the importance of an empty stomach if absorption is to be adequate. Buffers and tablets were found to have no advantages, a simple solution in water being recommended.

A similar study was made by Markowitz and Kuttner. They gave a standard oral dose of 50,000 units to children at various times before and after meals, and found that a satisfactory blood level was usually maintained for two hours only when the dose was given after a four-hour fast. Accord-

ing to these findings the continuous maintenance of a therapeutic blood level by the oral administration of any reasonable dose must be impossible. It may well be concluded that older children should be treated like adults and given penicillin intramuscularly, at least in the first stage of the treatment of any severe infection. The form of oral treatment with penicillin which has the best justification is the addition of the drug to the foods of infants in the way suggested by Buchanan.

The *Journal of the American Medical Association*³ states that a few years ago several articles appeared which advocated use of large doses of ascorbic acid in the early stages of acute rhinitis. Subsequently little evidence has appeared to support the contention that this therapy has any appreciable effect in aborting or cutting short the attack. Personal experience also fails to support the claim. Harmful effects have not been reported or experienced by the writer. More recently the use of tripeleunamine hydrochloride or other antihistaminic drugs has been recommended in the early stages of acute rhinitis on the assumption that vasodilatation responsible for the free flow of nasal secretion could be controlled by these drugs. Beneficial effects are reported by a few persons, but controlled statistics are not as yet available.

The study reported by Cowan and Diehl⁴ was conducted at the request of the Commission on Influenza of the Office of the Surgeon General, United States Army. The experimental subjects were students of the University of Minnesota. A controlled study indicates that influenza vaccine A and B is of no value for the prevention of the common cold. The subjects who received influenza vaccine reported more reactions than the control group.

Dukes and Gillespie⁵ immunized 100 children with influenza virus vaccine types A and B. In the vaccinated group, 42 per cent were between 19 months and six years of age, 50 per cent were between six and 10 years of age, and 8 per cent were between 10 and 16 years of age. A group similar in number and age distribution served as controls. Immuniza-

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tion consisted of two injections of the vaccine, 0.5 cc. at each injection and at intervals of one week. Smaller doses were given to 14 children. The incidence of influenza in the immunized and control groups was not unlike except for the youngest age group, in which the incidence of influenza was much less frequent in the immunized children. The authors were impressed by the frequency of reactions from the injections and the incidence of rather severe reactions in the younger children. Perhaps a dosage of vaccine dependent on body weight, as with typhoid vaccine, would reduce the number and severity of reactions. Further studies of larger series of children are necessary to evaluate accurately the effectiveness of the vaccine and to determine proper immunizing doses.

Brewster⁶ used diphenhydromine hydrochloride ("benadryl hydrochloride" N. N. R.) experimentally in the treatment of about 100 cases of the common cold. It has been found to completely abort 10 per cent of such cases and to shorten the course and afford subjective relief to the patient in 95 per cent of all cases. This is due to its inhibiting effect on the serous discharge from the mucous membrane of the upper part of the respiratory tract and its soporific effect. It inhibits the cough reflex, especially in children, probably because it eliminates postnasal drip.

COMPLICATIONS OF ACCESSORY SINUS DISEASE.

Crowe and Lett⁷ state that it is the oft-repeated, acute bacterial infections that eventually lead to chronic suppuration and necessitate radical operations. The mucous membrane of the accessory nasal sinuses has a remarkable ability to recover after a single or an occasional infection.

They believe that the nasopharynx is a very important portal of entry of the common cold virus, for the first symptoms after experimental inoculation of the nasal passages of chimpanzees or human volunteers with the common cold virus is hyperemia and irritation in the nasopharynx, not in the nose or the pharynx.

These findings suggest that it is possible for the otolaryngologist to do more to prevent recurring virus infections and their complications than either the pediatrician or the internist whose therapy is limited to vitamins, nasal drops and antibacterial drugs. These measures usually lead to the recovery of the acute condition, but in no way protect against a recurrence of a virus infection. The only known way to lessen the frequency of colds and to prevent recurrence of pyogenic complications is to remove or change the contour of hyperplastic or chronically infected nodules of lymphoid tissue in the nasopharynx with surgical operation, irradiation or both.

This paper also describes their method of dealing with acute frontal sinusitis.

Conservative treatment was effective in 16 out of 104 patients. In the remaining 88, immediate external drainage was performed with excellent results; therefore, in addition to the administration of antibiotics, in selected cases, to relieve pain, lessen the danger of osteomyelitis and other complications they advocate external incision through the unshaven eyebrow and drainage. The chief advantage of external drainage is that it makes unnecessary intranasal instrumentation, which not only is very painful but damages the acutely infected edematous mucous membrane of the nasofrontal duct. The less the infected mucosa in this area is handled, the more likely it is to return to normal when the acute process subsides. Nothing should be done, while trying to tide the patient over the acute period, that will traumatize the infected, edematous mucous membrane of the nasofrontal duct, since this may lead to the formation of granulations and scar tissue that permanently impair drainage, and to the development of a chronic sinusitis. It is far easier to prevent a chronic sinus infection than it is to cure it.

Smith and Spencer⁸ review a group of cases illustrating infections, mucocoeles, epidermoid cysts and osteomas of the nasal sinuses responsible for complications of the orbit. There are no children among the 12 cases, but the grouping, description and illustrations are so good that the article should be

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read by those who have to deal with such complications in children. The authors show that the diagnostic problems involved are often complicated and that a painstaking, thorough rhinologic investigation is required to avoid unnecessary delay in making an accurate diagnosis and in carrying out adequate therapeutic measures. The laryngologist should be the first and not the last consultant in these cases, and for him it will frequently be a problem requiring the most careful observation and study.

Glass⁹ reports the case record of a patient aged 14, who would undoubtedly have died before the penicillin era but recovered with the use of penicillin. The course of a dreadful illness of two and one-half months' hospitalization, during which four operations were performed, is graphically and excellently portrayed and enables a surgeon with such a case on his hands to gain much that can be of assistance to him. The patient was last seen 10 months after discharge from hospital. He is in perfect health. There has been no evidence of residual disability.

Johnson¹⁰ reports a survey of the patients entering the ear, nose and throat service of the Los Angeles General Hospital covering a period of 10 years from 1935 to 1945, to determine the incidence of frontal sinusitis. During this period, 51,692 patients with diseases of the ear, nose and throat were seen in the outpatient department; of these, 22,513 were hospitalized. Sixty-eight of these had frontal sinusitis which required hospitalization.

Fifteen of these were children 14 years of age and under. The youngest was nine years of age. There was only one death; a child of 13 had osteomyelitis; trephination was performed; death occurred from epidural abscess. Eleven other children required trephination and recovered.

TREATMENT - DIPHTHERIA CARRIERS.

Medwick and Hallberg¹¹ believe that the finding of a fetid, irritating, unilateral or bilateral nasal discharge causing excoriation and swelling of the alae nasi and the upper

lid should arouse suspicion of the presence of diphtheria organisms. When patients have a chronic nasal discharge, the routine submission of specimens will, on occasion, reveal *cornebacterium diphtheriae* among the etiologic organisms.

Since all strains of *cornebacterium diphtheriae* are not pathogenic, it is necessary that a test of virulence be made to determine the status of cultured organisms; moreover, there is considerable evidence that a patient may acquire a virulent strain of *cornebacterium diphtheriae* and then carry it in the nose indefinitely without any clinical manifestation of toxic effects. The virulence of the organisms lodging in the nasal mucosa may become attenuated so that the organisms are harmless. At some future period, the virulence of these organisms may be reactivated by either local trauma or an infection with other bacterial forms.

A variety of therapeutic measures have been and still are being utilized in the treatment of diphtheria carriers. Roentgen therapy is more widely resorted to in Europe than in America and is said to be harmless and appears to be highly effective. The use of chemotherapeutic agents seems generally to be very favorable. Sulfonamides and penicillin have been found very effective. On the other hand, Herrell found the effectiveness of penicillin very disappointing and he advises that the administration of penicillin should be combined with standard procedures such as the use of diphtheria antitoxin.

ALLERGY.

Hansel, Black and Ashley¹² present a very long, comprehensive and well arranged article on allergy in otolaryngology. The reader is recommended to the original paper.

An increase in the circulating eosinophiles¹³ is a feature of a number of disorders which otherwise appear to have little in common. There are groups of conditions, such as allergic diseases of all kinds, parasitic infestations and cutaneous eruptions, in which we can at least say that sensitization, a metazoan parasite, or a visible skin disease links the groups

together; but outside these categories come a number of other conditions which appear to have nothing to do with the three main groups. One of these is lymphadenoma: enlargement of lymph glands with eosinophilia nearly always leads to the diagnosis of that disease. Sometimes, however, eosinophilia with enlargement of lymph glands occurs in serum sickness and may be confusing.

Allergic eosinophilia is most variable in its appearance. Many patients with severe asthma have no eosinophilia; on the other hand, there may be marked eosinophilia in patients who react acutely for the first time to certain drugs or food-stuffs.

Symptomless eosinophilia is most often due to metazoan parasites, and in certain parts of the world where helminth infestation is universal, eosinophilia is equally common.

Some other conditions commonly associated with eosinophilia are: periarteritis nodosa, eosinophilic granuloma of the skin, and eosinophilic granuloma of bone. There are numerous others in which tissue or blood eosinophilia may be present, but in most of them the eosinophilia is erratic and of most uncertain significance.

There is, in fact, no apparent link between all the varied conditions in which eosinophiles are a prominent feature; but it is worth remembering that ignorance about the function of all other leucocytes, except the polymorph, is as great. No one has suggested what function a basophile cell or a monocyte may be expected to carry out. Lymphocytes amount to 40 per cent of circulating cells, yet few hematologists would like to be dogmatic about their purpose. If the eosinophile is a mystery, it is at least in good company.

Turner¹⁴ took issue with certain statements in the above editorial. He feels that the eosinophile is part of a defense mechanism and that the occurrence of eosinophilia not otherwise explicable suggests the presence of a known, unknown or facultative allergen. He is certain that further work on

the eosinophile is long overdue and would be amply repaid, just as he is convinced that eosinophilia is protective in intention and never causative, however high the count.

Babalian¹⁵ shows that the technique of scratch or intradermal tests for food allergies is based on questionable hypotheses. He discusses some of these hypotheses and shows that neither in eczematous dermatitis nor in urticarial lesions are intradermal tests of value in detecting food allergy. As a result of the mistaken confidence in these tests, disorders have been mistakenly regarded as due to food allergy when they were due either to malnutrition, infection or contact dermatitis. Confidence in skin tests for food allergy has had the unfortunate result that food allergies are regarded as common, which in reality they are not; they are rare in adults and children after the sixth year. Skin tests are of value in other forms of allergy. The importance of contact dermatitis is recognized more and more. Many eczemas formerly regarded as caused by food are now recognized as contact dermatitis.

The part played by sensitization¹⁶ in diseases of the eye has been studied experimentally and clinically for many years; however, ophthalmologists and allergists do not all agree on what they mean by allergy.

Duggan defines allergy to include all those aseptic or abacterial lesions in which the common element of the basic morbid process is either increased capillary permeability or excessive contraction of smooth muscle in the arterioles, or both. He develops the thesis that an allergic disorder of the ocular tissues can be interpreted as a manifestation of localized vascular dysfunction. Treatment is by vasodilators. He has been treating many of these conditions with vasodilators for some 10 years with beneficial results. The times taken to cure seem to be much shorter than by the more usual methods of treatment. His vasodilator therapy consists in intravenous sodium nitrate 0.1 gr. daily, with erythrityl tetranitrate 30 mg. once or twice a day. Nicotinic acid 100 mg. t.d.s. with erythrityl tetranitrate was used in one case.

To the question, "Does anaphylaxis to vitamins occur?"¹⁷ the *Journal of the American Medical Association* replies that although sensitivity to vitamins has been reported in the literature, confirmation is needed before such studies can be accepted. Some of the "allergic" responses produced by vitamins may prove to be due to impurities or other extraneous factors rather than the vitamin *per se*. Toxic reactions to extremely large doses of certain vitamins have been reported, but these reactions are toxic rather than allergic in nature. As the occurrence of proved allergic or anaphylactic reactions to chemically pure vitamins requires further study, a categorical answer cannot be given to the question.

Criep¹⁸ presents a short review of allergic rhinitis from the point of view of the allergist. He states that children so afflicted are prone to experience itchiness of the nose and develop mannerisms such as sniffing, nose wrinkling and nose rubbing, and provides a useful illustration.

He stresses the value of cooperation between allergist and rhinologist.

Local nasal pathologic changes and mechanical obstructions such as deflected septums, polypi and hyperplastic tissue, must be removed in order to restore nasal function, for this not only affords symptomatic relief but helps prevent nasal and sinus infection, a frequent complication of untreated and unrecognized nasal allergy. Rhinologic treatment should always be conservative at first, especially if there is a decided allergic factor.

Ionization of the nasal membrane is not only beneficial but harmful. Roentgen ray therapy to the nose is of doubtful value. Radon or radium therapy or Roentgen therapy to the nasopharynx is helpful in the presence of associated lymphoid hyperplasia and infection in that region. Tonsillectomy is not specifically indicated.

It is obvious, therefore, that good therapeutic results are predicated on the closest possible cooperation between allergists and rhinologists, with the realization that a considerable

percentage of patients suffering with nasal symptoms are allergic and that failure to recognize early and treat properly the allergic state in these patients accounts for many therapeutic failures. On the other hand, many patients suffering with allergic rhinitis will fare better if given the benefit of rhinologic attention.

Calder¹⁹ reports experiments in treatment with Anthisan of six cases of hay fever and 38 cases of vasomotor rhinitis. Anthisan was effective in all six cases of hay fever and in 29 of the 38 cases of vasomotor rhinitis. Side reactions developed in four of the 44 cases, but they were never severe.

The dosage needed to keep the patient in comfort was, as a rule, 0.6 gr. a day. The treatment was tolerated well by children with 0.3 gr. a day. In 10 stabilized cases an attempt was made to reduce the dosage gradually but failed. A constant dosage seems to be required, which cannot be reduced without return of part of the symptoms. The dosage of 0.6 gr. a day was preferred in three doses rather than divided into six doses.

With two exceptions in the present series, the improvement in symptoms was accompanied by a corresponding improvement in the state of the nasal mucosa. The pale, boggy turbinates shrunk and became pink, while the amount of secretion in the nose returned to normal. Administration of Anthisan for weeks or months apparently did not damage the nasal mucosa.

IRRADIATION.

Gill²⁰ reports his observations on the clinical effectiveness of radium therapy in the pharynx from a series of 50 cases, about half of them children. In a group of 14 patients with conduction deafness, normal hearing was recovered in seven. Six adults were treated for aerotitis. Of 15 children, 12 years of age or under, with allergic rhinitis and bronchial asthma, eight showed marked improvement after the second treatment, manifested by improvement in cough and decrease in nasal blockage and discharge. Fifteen cases with perception deafness showed no improvement.

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Hochfilzer²¹ conducted differential blood examinations in children who showed clinical evidence of hyperplasia of Waldeyer's ring but gave no history of any serious infections of those structures. The purpose was to find out whether the number of lymphocytes circulating in the blood is influenced by such hyperplasia. It was clearly demonstrated that even very marked, long standing hyperplasia does not alter the absolute or relative number of lymphocytes. This again brings out the fact that lymphoid tissue in the digestive tract embedded in the mucous membrane is functionally different from the lymphoid tissue in the lymph nodes. Most of the lymphocytes produced in this structure find their way through the epithelium into the digestive tract. Most authors feel the barrier theory is untenable but believe further investigation of the microchemical process of the lymph cells might bring light as to the function of the lymphoid tissue of Waldeyer's ring.

Dalton²² states that the relationship of hypothyroidism to the lymphoid hyperplasia and infection is never more marked than in hyperactivity of the thyroid gland. He, therefore, believes it necessary to diagnose and correct thyroid dysfunction and suppurative sinusitis before removing hyperplastic lymphoid tissue by physical means. In the majority of cases the more radical means will be unnecessary.

Theobald²³ believes that more attention should be directed to routine examination of the nasopharynx. He reviews 150 cases of epipharyngeal pathological conditions in the order of frequency of associated symptoms. In 40 cases the most prominent symptom was postnasal discharge. Next in order of frequency was recurrent sore throat which occurred in 35 cases. The other conditions presented in order of frequency were: cough, earache, recurrent colds, hoarseness and bronchitis, epipharyngitis, fever, bleeding, crusting, and one case each in occipital headache, asthma and tuberculosis.

PHARMACOLOGY.

House and Carey²⁴ call attention to some side effects of nasal vasoconstrictors that are apparently much more com-

mon than the literature would indicate. They present one case and review four others with the following conclusions as to the systemic effects that may follow the administration of Privine to children:

1. Prolonged hypertension with peripheral vasoconstriction.
2. Mild cortical stimulation, followed by depression.
3. Depression of basal centers — bradypnea, low temperature, tachycardia followed by bradycardia.
4. Resembles and potentiates the action of the barbitals in depression of respiration.

PHYSIOLOGY.

Proetz,²⁵ in an address at the Royal Society of Medicine, epitomized those individual observations in nasal physiology during the last 10 years which are apt to have an influence on our clinical management of nasal disease.

His remarks should be read in the original. Only a few observations can be given here.

Today the teaching is to conserve tissues and functions wherever possible. It is very desirable to maintain the continuity of streaming of mucus from sinus to sinus, to meatus, to nasopharynx. Apparently a small amount of injury of the nasal mucosa did not appear to make much difference. Numbers of people had considerable areas in the nose which were devoid of cilia altogether, and they got along just as well as other people. If the mucosa was anything like normal, the cilia around the edge of an inactive area could pull the stream along for quite a distance, so that the inactive area did not really signify. There were no cilia in the preturbinate area, and yet the cilia at the margin were strong enough to carry the whole mucus right across the surface. If, therefore, the ciliated area were destroyed here and there, it did not seem to make much difference, though if the destruction was at an important spot, of course, there was trouble.

It has been shown clinically that deficiency of the thyroid hormone may result in changes in the nasal mucosa which can be recognized. These changes may be either exfoliative in nature or resemble the pale, boggy manifestations of allergy. Patients deficient in the thyroid membrane commonly have an increased tendency to nasal infection which can be corrected by the administration of thyroid extract alone. Similarly, allergic individuals are less apt to exhibit nasal symptoms under an adequate thyroid supply.

Yoffey²⁶ states that the nose in mammals possesses a rich submucous lymphatic plexus, which drains finally into the deep cervical duct or jugular lymph trunk. The deep cervical duct descends alongside the internal jugular vein to enter the thoracic duct on the left side and the right lymph duct on the right. The deep cervical duct in man passes through several small lymph nodes strung along the course of the duct.

This deep cervical pathway can be clearly demonstrated as a functioning unit by the nasal instillation of a vital dye. The dye passes through the intact mucous membrane, enters the submucous lymphatics, and passes through the lymph nodes and the cervical duct to reach the blood. Not only dyes but also proteins of low molecular weight, such as egg albumin with a weight of about 34,000, can readily pass through the living and intact nasal mucosa and be identified in the lymph of the cervical pathway.

Particulate matter such as India ink does not traverse the mucous membrane after nasal instillation, nor do viruses, in a susceptible animal pass through the nasal mucosa immediately; however, after a period in which they proliferate locally and become established in the mucous membrane, they then enter the cervical pathway and reach the blood in a steady and continuous stream. They are not prevented from reaching the blood stream by the filtering action of the cervical lymph node.

The lymph in the cervical pathway in part arises from the capillary filtrate of the submucous blood vessels; but it also

seems certain that some of the cervical lymph is derived from the cerebrospinal fluid, leaving the skull through the cribriform plate in association with the emerging bundles of the olfactory nerve.

If bacteria and viruses behaved as inert ink particles, no infection of the nose would be likely to reach the brain, against the current of the cerebrospinal fluid. On the other hand, bacteria or viruses which obtained access to the cerebrospinal fluid — *e.g.*, in meningitis — would certainly reach the nasal mucous membrane and the cervical pathway; and while viruses would find no difficulty in traversing this pathway, for the reasons already stated, bacteria would be held up in the uppermost node or two of the chain.

Fabricant and Perlstein²⁷ state that the pH of nasal secretions *in situ* in clinically normal nasal passages of a group of 44 infants and children was found to range from 5 to 6.7. In a group of 17 infants and children with abnormal nasal findings, nasal pH ranged from 7 to 8 in acute rhinitis, from 6.7 to 7.2 in subacute and subsidiary rhinitis, and from 7.2 to 7.3 in active allergic rhinitis.

The pH of nasal secretion *in situ* in the clinically normal nasal passages of infants and children has been found to range within levels (5.0 to 6.7) indicating a slightly acid state of the secretion. Fabricant and Perlstein²⁸ studied the effect of hyperventilation and crying on the pH of nasal secretion *in situ* in a group of 39 infants and children; 13 children engaged in experimental hyperventilation, while 26 infants and children had their nasal pH recorded while they were crying. Of the 13 children instructed to hyperventilate, six were found to show a measurable trend toward nasal alkalosis, and seven showed no appreciable variation in nasal state as indicated in pH. In 23 of 26 infants and young children engaged in crying, the dominant finding was the establishment of an alkaline nasal state.

HEMORRHAGE — NASAL.

Dickie²⁹ remarks that epistaxis is, as a rule, a trivial condition and merits very little attention, as will be seen by the

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scanty references to it in rhinologic articles and textbooks. It is evident on scanning most textbooks that the authors generally have had very little personal experience with severe nasal hemorrhage, judging by the treatment they recommend; however, at times it can be a dangerous condition. He writes a long record of the various means he has employed. The majority of the methods are applicable to children as well as adults. The reader is recommended to the original.

TONSILS AND ADENOIDS.

In an editorial on the removal of children's tonsils,³⁰ the *British Medical Journal* states that an intelligent layman might well be surprised that doctors had not reached definite conclusions about the value of an operation which has been performed upon more than 1,500,000 children attending public elementary schools in England and Wales during the past 20 years; and he might argue that there should be a closed season for tonsils until more is known of their functions. Though there is little precise knowledge on this point, few will deny that the location and cellular structure of the tonsils suggest that they contribute to the individual's defense against bacterial attack. They may be compared to filters, with the cervical lymphatic glands as a second line of defense. If it were possible to say from the patient's history and from direct observation that tonsils are diseased beyond natural repair, there would be a good case for their removal and, if it were surgically possible, their replacement by healthy tonsillar tissue. The chief difficulty confronting the clinician is one of diagnosis. Simple hypertrophy — probably a beneficial reaction — should no longer be regarded as an indication for operation; and the history of frequent recurrences of tonsillitis is now thought to be a more valuable guide than clinical examination of the tonsils. Statistical evidence, though difficult to assess, would appear to favor a conservative attitude towards operation.

There are, however, certain aspects of tonsillectomy which justify definite statements. It is a major operation, never urgent, and it should be preceded by a period of observation

of six months after the completion of any necessary treatment of teeth and sinuses; it should not be performed in Winter or early Spring, nor when infectious diseases are prevalent; and it seldom improves the condition of patients with established systemic diseases such as nephritis or rheumatism.

Glover³¹ believes that pediatricians should approach the problem of tonsillectomy with caution. The incidence of tonsillectomy remains excessive, particularly in children between five and seven years of age. This age distribution suggests that many tonsillectomies are performed because of enlargements which are either physiologic, associated with the great changes in development during this critical period, or immunologic responses to the unaccustomed infections met with on entrance to school or to the sepsis resulting from the decay of the primary teeth. Tonsils cannot be determined as "diseased" or "infected" by clinical examination. As their function includes the arrest of pathogenic organisms, the fact that these can be found in them is no justification for operation. Tonsillectomy should command the respect due to a major operation. In some cases it is followed by unpleasant sequelae. It has a mortality which, though small, is larger than is generally appreciated. Tonsillar remains may be more harmful than the original tonsils. The most reliable indication is the occurrence of frequently repeated attacks of acute tonsillitis which cannot be explained by extraneous infection. Indications such as frequent colds, chronic nasal catarrh and otitis media are misleading. To remove the tonsils to cure sinusitis is to put the cart before the horse. Certain other conditions, including bronchitis, asthma and nephritis, are definite contraindications. The value of the operation in benefiting acute rheumatism is doubtful. The incidence of otitis and mastoid disease is the same or perhaps slightly increased in the tonsillectomized, while their liability to bronchitis and pneumonia is increased.

Penrose³² writes that the whole question of the success or otherwise for the removal of tonsils and adenoids depends

upon a proper selection of cases. After a large number of years as a general practitioner and assistant medical officer of schools, he came to the following conclusions:

1. It is one of the most successful operations when performed in suitable cases.

2. It is often performed in unsuitable cases.

3. The habit of bracketing tonsils and adenoids together is a mistake. Enlarged adenoids are infinitely more often the cause of trouble than enlarged tonsils, because they quickly obstruct nasal breathing and give rise to mouth breathing. Enlarged tonsils alone very seldom do this.

4. Tonsils should not be removed just because they are enlarged or because purulent-looking material can be expressed from them. Tonsillectomy should be performed only when there is a history of recurrent attacks of tonsillitis with persistent enlargement of the tonsillar glands of the neck.

5. Adenoids, however, should be removed if causing slight nasal obstruction, deafness or earache, and should always be followed by deep breathing exercises through the nose to re-establish nasal breathing. If nasal breathing is not re-established the condition will recur.

He believes that in children the tonsils are part of the mechanism of the manufacture of the antibodies of various infections, particularly streptococcal ones, and should be preserved if carrying out those functions properly. Persistent enlargement of the tonsillar glands is evidence that they have failed and have become a permanent source of infection and should, therefore, be removed.

Boies⁸³ states that although tonsillectomy should be a worn-out subject, he disagrees emphatically with the contention that the tonsil and its surgical treatment need be a problem. When a tonsil operation is performed by one adequately trained and with good technique it is a highly satisfactory procedure in terms of the end-results. He has not found it a simple minor surgical procedure; it is not followed by any serious morbidity and should never result in a mortality.

In the minds of the laity — and for some of the medical profession — tonsil surgery is a cause for concern on three counts: the indications, the probable inadequacy of the operation and the associated morbidity and even mortality. In the hands of the trained laryngologist, none of these three aspects of the tonsil operation need be a cause for concern.

The faucial tonsil which is cleanly enucleated with complete removal of the plicae does not grow back. Lymphoid ingrowths from the lining of the fossa are common. These are often erroneously called tonsil remnants. Ordinarily these lymphoid ingrowths are not a source of any significant pathologic condition.

The article is clear and concise and furnished with unusually appropriate illustrations.

Gooch and Lillie³⁴ state that from the study of tonsil tags at the Mayo Clinic and of the literature on this subject, it is clear that the physiology of the tonsil is poorly understood. Their study also indicates that the presence of tonsil tags is difficult to demonstrate in many instances and reliance should be placed on qualified otolaryngologists for this examination. Tonsil tags were found to be more dangerous from a standpoint of infection than are whole tonsils.

Myerson³⁵ presents a plea for greater attention to the adenoid operation. He uses a modification of the Goodwillie palate retractor to afford visualization of the nasopharynx. This retractor is in position at all times while the adenoid removal is in progress. The instruments he uses are modifications of the Ruault instrument and of these he employs three sizes.

Gray and Garson³⁶ state that adenitis of the tonsillar lymphatic gland is usually due to an infection of the throat that is clinically evident. They report that from May to November, 1946, the outpatient department of the Belgrave Hospital for Children saw a minor epidemic of massive adenitis of the tonsillar lymphatic glands with minimal or no sign of tonsillar infection. A series of 21 cases is described and there

is a photograph of a typical patient. There was no evidence of infectious mononucleosis, but eight children had a true lymphocytosis, and it seems possible that the condition was a variant of infectious lymphocytosis.

Commenting on the preceding article, Miller and Court³⁷ state that in Newcastle-Upon-Tyne a team of visitors and doctors studying all the infectious illnesses of 1,100 infants have been watching for four months the development of an epidemic in that city which has been generally regarded as mumps. The striking prominence in some cases of undoubted tonsillar lymphadenitis made them initially skeptical of that diagnosis, yet the speed of onset, the absence of pharyngitis, the minimal disturbance of general health, the incubation period of from 14 to 19 days, and the massive character of the swellings and their disappearance within a matter of days, suggested that this was an unusual type of lymphadenitis. It was not until the disease affected one of their own families that a possible explanation was found, and they have no reason to doubt the diagnosis of mumps in these cases.

From their observations they believe that mumps may cause a striking cervical lymphadenitis and wonder whether some of the cases reported by Gray and Garson could not be explained in this way.

Livingston and Neary³⁸ studied tonsillectomized children less than 13 years of age to determine whether the routine post-tonsillectomy use of a chewing gum containing acetylsalicylic acid induces prothrombinopenia and, if so, whether secondary postoperative hemorrhage is etiologically related to the lowered blood prothrombin.

A group of 29 such patients received chewing gum tablets containing approximately 0.23 gm. (3.5 gr.) of acetylsalicylic acid in a dosage of five to six tablets daily from the first to the seventh postoperative day. A control group of the patients received, in the same dosage, chewing gum tablets containing a similar amount of acetylsalicylic acid and, in addition, 0.5 mg. of menadione.

No specific variation of prothrombin time, which normally appears to vary widely, could be ascribed to either acetylsalicylic acid or to the acetylsalicylic acid and menadione administered in chewing gum.

Fox and West³⁹ point out that in several articles they have reported a study of 687 cases of tonsillectomy and adenoidectomy. Group I included 216 patients who used aspirin chewing gum as desired through the postoperative period; of this number, 9.7 per cent reported late (secondary) bleeding. In Group II, 128 patients took 10 mg. of synthetic vitamin K twice daily for seven days postoperatively along with aspirin chewing gum as desired; in this group there was a 10.1 per cent incidence of secondary bleeding. Group III consisted of 343 patients who were not permitted to use aspirin chewing gum at all; no synthetic vitamin K was taken by them; the incidence of late bleeding in this group was 0.58 per cent.

They concede that the simultaneous administration of vitamin K with salicylate will protect a normal individual against a salicylate-induced hypoprothrombinemia but hypoprothrombinemia is not considered the usual cause of late tonsillar bleeding. They still consider that the high incidence of late tonsillar hemorrhage in patients using aspirin chewing gum is due to some local effect on the wound.

They conclude that aspirin chewing gum, or similar locally-acting drugs, must be avoided entirely during the postoperative period.

POLIOMYELITIS AND TONSILLECTOMY.

*The Lancet*⁴⁰ is of the opinion that on present evidence it seems that the pharynx should continue to receive at least as much attention as the bowel when attempts are being made to trace the source from which the virus of poliomyelitis has spread. The argument is as follows:

The isolation of virus from the secretions and excretions of poliomyelitis patients and their contacts continues to occupy the attention of many investigators in the United States. In

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Chicago, during the Summers of 1945 and 1946, daily swab-bings were made from the throats of children who were under observation as contacts. Gordon and his associates subsequently tested pools of material from five of them, selected because they eventually developed poliomyelitis, and in three showed that virus was present in the pharyngeal secretions at varying periods up to six days before the clinical onset of the disease. Virus has been isolated from the stools as early as 19 days before the onset of illness and as long as two months or more after recovery. From the pharynx it has not been obtained after the first week of illness. Studies such as those of Aycock and Kessel have shown that the infectivity of clinical cases is limited to a period extending from about four days before to about five days after the onset of illness. This is almost precisely the time during which virus can be demonstrated in the pharynx and the correlation is sufficiently striking to suggest that case-to-case spread is more often due to the transmission of pharyngeal virus than of bowel virus.

Unrecognized infectious and healthy carriers are the probable cause of poliomyelitis which cannot be ascribed to contact with a previous case — usually a proportion of at least 20 to 30 per cent in epidemics. Melnick and others have found virus in the nasopharynx after illnesses regarded on circumstantial rather than on clinical grounds as poliomyelitis, and intestinal carriers of virus have often been found in contacts who were free of symptoms. Search for healthy pharyngeal carriers has not yet been made on any large scale, but Howe and Bodian recently demonstrated virus in the pharyngeal secretions of two out of 28 healthy children sharing a playground with the brothers and sisters of a clinical case; and Kessel and Moore, using material obtained during tonsillectomy, showed that virus was occasionally present in the nasopharynx of healthy children at times when there were no overt cases of poliomyelitis.

Hilding⁴¹ states that there is still a great deal of doubt as to the causative relationship between tonsillectomy and bulbar poliomyelitis. He describes the unusual occurrence of polio-

myelitis in four brothers, two of whom had had tonsillectomies two weeks previously. Three of the four developed bulbar symptoms, and only one of these had undergone tonsillectomy. The one who had undergone tonsillectomy, however, was very much more ill than the other two, and eventually died; however, the second one who had undergone tonsillectomy was the only one of the four who showed no degree of bulbar palsy.

Cunning¹² reports the survey of the United States reports made on the incidence of poliomyelitis in tonsillectomized patients for 1947. Although several hundred questionnaires had to be discarded for the lack of sufficient information, he has been able to tabulate in various ways the information from 25 states as compared with 13 states in 1946, and has traced *43 per cent* of the poliomyelitis cases reported throughout the country in 1947, as compared with 23 per cent for 1946. The disease was rather mild in 1947.

After several years' work on this poliomyelitis-tonsillectomy survey, and watching the analysis and classification of thousands of cases in bulbar, spinal and mild into the different age groups, the number of poliomyelitis cases following tonsillectomies and those following other operations and injuries, from all sections of the country in mild years and severe ones, he is more convinced than ever that there is no causal relationship between the two and that when a bulbar poliomyelitis follows a tonsillectomy it is a coincidence.

He does not advocate the indiscriminate removal of tonsils during any severe epidemic and has no desire to place his patients' lives in jeopardy through injudicious surgery; but he certainly does not think that this operation should be postponed indefinitely because the summer months are the months in which poliomyelitis is prevalent.

He advocates that this survey be carried on from year to year, for he feels certain that when accurate statistics are available on thousands and thousands of these cases, it will be difficult to convince anyone that tonsillectomy predisposes a patient to poliomyelitis.

The Section of Otorhinolaryngology⁴³ of the British Medical Association devoted a session to discussion of poliomyelitis and tonsillectomy.

Allan M. McFarlan recounted the history of five children in one family who developed bulbar paralysis nine to 14 days after tonsillectomy; three of them died. Many workers had noted a tendency for the bulbar type of paralysis to develop within 30 days of operation. Absence of tonsils appeared to predispose towards the bulbar rather than the spinal type of paralysis. He admitted the risk was very small, but it was, of course, greater during epidemics. The only safeguard was to avoid operations on the tonsils during an epidemic.

Geoffrey H. Bateman said that clinicians had refrained from operation during epidemics mainly because of publicity, but the risk was extremely small, even at the height of the epidemic. The effect of the four months' break in operating in 1947 had been to add enormously to the waiting list. He thought parents were better judges than the physicians of the harm caused to their children by such postponements.

In reply to the question as to why this operation was singled out, it was stated that operations other than tonsillectomy appeared to have no bearing on the paralysis.

Layton⁴⁴ discusses an opinion expressed at the Preventive Medicine Session of the British Medical Association that the prohibition of tonsillectomy during epidemics of poliomyelitis is the only useful administrative measure of control against the disease. The authority concerned, a leader in his branch of medicine, wants temporarily to stop all removal of tonsils during a time when some disease is prevalent that seems to him of greater importance.

Let us see where such an order might lead us to. Poliomyelitis is not the only disease to which it might be applied. The post-tonsillectomy measles mastoid is so deadly that to take out tonsils during an epidemic of measles from a child who has not had the disease is as risky as to do so during an epidemic of poliomyelitis. Then, were such an order made,

he would demand that it be extended to all such operations during the Winter months and should have behind him the support of many leading physicians. He applied the principle of cessation of tonsil operations during Winter months and during measles epidemics for 20 years and had never seen any "trouble" arising from the delay; but if temporary cessations, seasonal and epidemiological, of tonsillectomy are much to be desired, why should not the administrative fiat be extended to the whole holocaust of tonsils that has been going on for a quarter of a century? It might be ordered that none should be removed under the age of nine, and then only for indications that could not be exceeded. No! Salutory as such orders would be in many ways, we cannot conduct the art of medicine by administrative fiats, and this part of the art must be amended by two other methods.

The first is that the profession as a whole should reconsider its approach to tonsillectomy. Practically every experienced physician in the land deprecates its excessive frequency. The Ministry of Education has, short of dictation, done all it can to limit the number arising from its school inspections. Yet, still it goes on to such an extent that it can only be explained as being due to a disharmony of the human mind. Future generations will, he believes, wonder, and some may laugh, at our propensity to it, just as we do at the bleeding and purging of the end of the eighteenth and beginning of the last century.

The other is that parents should again assume the responsibility for decision that they have so long laid aside. The doctor does not order, he advises. If parents would say, "No, I will not have my child operated on until the epidemic is over (or until the Winter is past)," they would find that the child is none the worse for the delay, and often that it has entirely recovered from the symptoms for which the operation was originally advised. The reassumption of their responsibility might thus lead inquiring minds to demand more from the doctors who advise this operation than they have in the past, and this in turn might ensure the profession as a whole making that reconsideration that seems so necessary.

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FRACTURE DISLOCATION OF THE NOSE.

Becker⁴⁵ found fractures in 100 out of more than 135 cases of nasal injuries. From his study of these, he formulates certain principles of management. Approximately half the cases were children.

This is a relatively long, illustrated article and only certain of his conclusions which apply definitely to children are here mentioned.

Early reduction, within the first few hours, is the procedure of choice. Epistaxis is often troublesome. It and edema may cause the surgeon to delay. It is better to wait until the edema has subsided sufficiently so that the true extent of the deformity can be studied. In some cases the fracture was reduced early, only to have it found a week later, when the edema had subsided, that there was still deformity which required secondary manipulation.

When the fracture was compounded externally and dirt had entered the wound, tetanus antitoxin and antibiotics or chemotherapy were administered.

Fractures seen as late as two or three weeks after injury can be reduced.

Fractures properly reduced are maintained in position by petrolatum gauze packing internally and dental moulding compound externally. Once reduced, the fragments will not again become displaced. The petrolatum packing was left in place from three to five days, the amount of time depending upon the severity of the fracture.

SURGERY.

Lefkon⁴⁶ believes that rhinoplastic procedures in children may be safely undertaken at an early age without in any way impairing the future development of the organ, and that in this way faulty facial development may be prevented, normal nasal function established and psychologic and physiologic disturbances detrimental to the growing child avoided.

In support of his assertion, he makes short references to articles describing the successful correction of a number of abnormalities and describes fully a successful result of his own.

This patient was a boy aged nine years and six months. His general appearance was that of a child with adenoid. The nasal bones were separated in the midline and the dorsum was flat. The ridges of the ununited nasal bones could easily be felt. The lower end of the nasal septum was S-shaped and projected into both nasal chambers. These factors, operating during the developmental period, resulted in the formation of a high palatal arch and a narrow protruding upper jaw causing malocclusion and overriding of the teeth.

Three operations were performed: hypertrophied lymphoid tissue in the nasopharynx was removed; the dislocated nasal septum was repaired; seven months later the flattened nasal dorsum was corrected by the insertion of a graft of preserved cartilage.

Many details are given which suggest that all the original defects, structural, physiological and psychological and dental, have been successfully overcome.

NEW GROWTHS.

Marks and Johnstone⁴⁷ discuss nasal rhinosporidiosis and report two cases, one of them in a girl, aged 14. Although rhinosporidiosis has a worldwide distribution, only 15 cases had previously been reported in the United States. The condition should be suspected when a mass in the nose is polypoid or papillomatous, with a strawberry-like appearance varying from a pink to a deep red, which bleeds readily. Using a proper light source, small white spots will be found distributed over the entire surface of the growth. These are the sporangia. The authors emphasize the necessity of preparing histologic sections of all nasal tumors so that the correct diagnosis may be reached.

Cruthirds¹⁸ describes the course of illness of a boy of four years of age who developed a swelling in the nasopharynx which terminated fatally with metastases in the lungs.

The boy was originally examined for a cold but three weeks later began to complain of difficulty in breathing, and four days later, quite blue and dyspneic, was found to have a swelling in the right side of the throat. In the belief that it was a peritonsillar abscess, it was incised several times. Some time later an otolaryngologist diagnosed the mass as a tumor and not an abscess. Two weeks later a hard nodular mass was without difficulty removed from the right pharynx and eventually diagnosed as an angioendothelioma arising from the buccal mucosa of the soft palate. Roentgenogram of the chest showed no metastases or bronchopneumonia. He soon ate well, slept well, breathed comfortably and seemed normal in every way. Five months later, however, routine chest radiography showed large areas of metastases which were growing rapidly, and the patient soon died.

From this case the author urges that the postnasal space in the child should undergo more thorough and frequent examination for early detection of tumors, as earlier treatment means better prognosis. Although angioendotheliomas are rare and do not metastasize frequently, the majority become malignant and may metastasize. Early treatment with X-ray and radium offers the patient his best chance.

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MINOR SALIVARY GLAND TUMORS IN RESPIRATORY TRACT AND EAR.*

Review of the Literature and Report of Two Cases.

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Some time ago the author discovered in a white male patient, 68 years of age, a small tumor in the anterior third of the left side of the dorsum of the tongue and also a much larger growth on the left true vocal cord and ventricle. Microscopic examination of tissue specimens proved the two masses to be of identical arrangement, and a diagnosis of mucoepidermoid tumor, originating within the minor salivary glands, was made by the pathologist (see Figs. 1 and 2). The patient died shortly after. At time of autopsy, a large hypernephroma of identical structure to the oral lesions was found to have existed in the right kidney. The growths of the tongue and vocal cord had consequently to be interpreted as metastatic growths of adenocystic adenomatous, and cylindromatous arrangement.

Metastases of so-called "mixed tumors" of the kidney to the oral cavity, ear, larynx and thyroid have been variously reported.⁸⁷ Nevertheless, the case briefly described in the foregoing could not fail to direct attention towards the study of salivary gland tumors in the somewhat less usual locations outside of the major salivary glands. It is perhaps noteworthy that within a relatively short time thereafter, two instances of true mixed tumors of the minor salivary glands were encountered in private practice. The author, furthermore,

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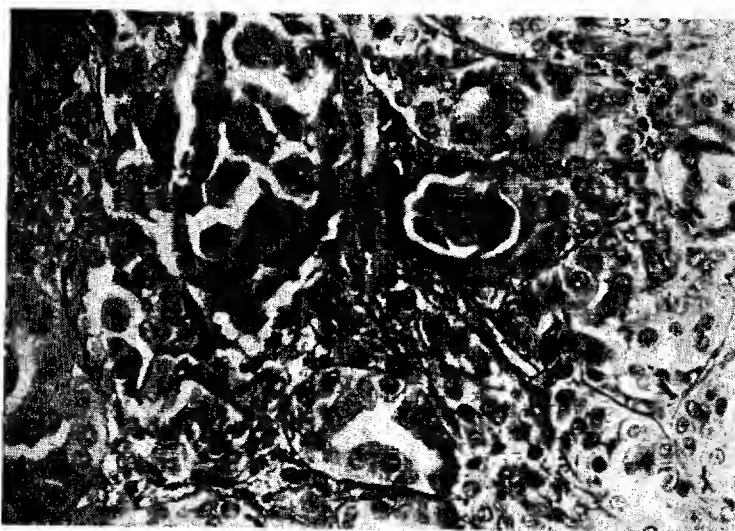


Fig. 1. Adenocystic adenocarcinoma of the tongue. Histopathologic diagnosis of biopsy specimen: mucoepidermoid tumor of salivary gland type. Diagnosis at autopsy: metastasis from hypernephroma of the right kidney. ($\times 120$.)

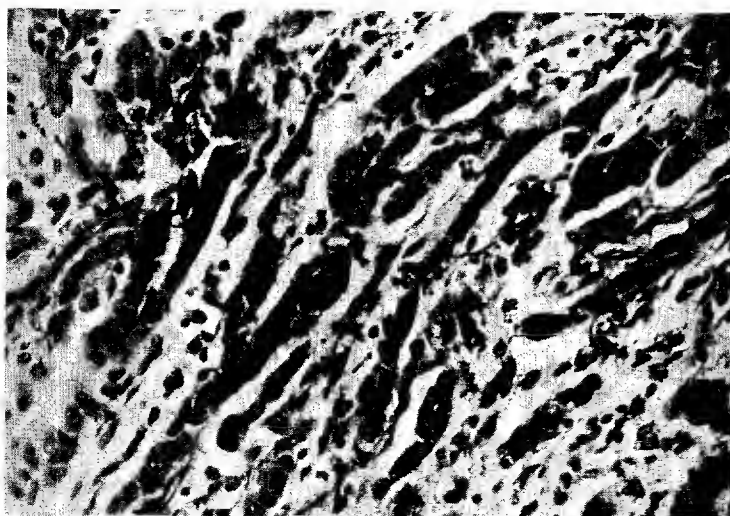


Fig. 2. Adenocystic adenocarcinoma of larynx, showing cylindromatous pattern. Same patient as Fig. 1. Histopathologic diagnosis of biopsy specimen: mucoepidermoid tumor of salivary gland type. Diagnosis at autopsy: metastasis from hypernephroma of the right kidney. ($\times 210$.)

was able to obtain data on two additional cases of the same type, through the kindness of Dr. J. M. Brown and Dr. C. E. Futch, both of Los Angeles.

While, of course, no conclusions can be drawn from such a small group of cases, the seemingly frequent occurrence of minor salivary gland tumors contrasts sharply with the prevailing opinion expressed, for instance, by McFarland,⁵⁶ that in most hospitals only a very few cases of this kind are seen each year. In this connection it may be of interest that at Los Angeles County General Hospital, with 58,418 admissions during 1947, not a single case of minor salivary gland tumor was reported by the department of surgical pathology. This question of the incidence of minor salivary gland tumors cannot be conclusively decided on the basis of a tabulation of a great number of published cases; however, it would appear that neoplasms of this type, though undoubtedly far less frequent than tumors of the major salivary glands, are not so rare as had hitherto been assumed.

Similar difficulties, as in the question of the incidence of minor salivary gland tumors, are encountered in various other respects. Ahlbom³ has made the pertinent observation that a conclusive understanding of these peculiar neoplasms requires a very large clinical and pathological tumor material. While a review of the literature should by no means be regarded as a substitute for such far-reaching study, it may at least be able to convey a preliminary impression of some of the more significant aspects of this group of neoplasms. Before reporting the results of this statistical and bibliographical research, a short review of the successive theories concerning minor salivary gland tumors and a brief description of their most characteristic histopathologic features will be attempted.

HISTORY.

According to Ahlbom,³ Ch. G. and J. B. Siebold, in 1793 and 1797, respectively, were the first authors to dedicate a separate monograph to the study of salivary gland tumors. The term "mixed tumor" was introduced by Minssen, in 1874.

Tumors outside of the major salivary glands received attention for the first time in 1851, when James Paget observed that mixed tumors of the lip have identical characteristics with mixed tumors of the parotid gland. Stephen Paget (1886) developed the theory that these tumors of salivary type may originate from any one of the small glands in the oral mucosa, but the glandular genesis of the entire group of mixed salivary tumors was conclusively proved only by Berger, in 1922.

The question as to the nature of the tissue within these glands, giving rise to mixed salivary tumors, has been variously answered at different times. A theory of mesenchymal origin was proposed by Billroth (1859) and Virchow (1863). Cohnheim, in 1883, introduced the hypothesis of branchial genesis of these neoplasms, a view which was modified and extended by Gontier, in 1904. At the present time, the prevalent theory is that these tumors originate wholly or at least chiefly from epithelial tissue, an interpretation defended by Krompecher in a series of papers and conclusively established by Zymbal,⁹⁰ in 1933.

HISTOLOGICAL CLASSIFICATION.

Before it is possible to give a description of the pathologic characteristics of tumors of salivary gland structure, appearing within the minor glands of respiratory tract and ear, it is necessary to ascertain what we understand when speaking of "salivary gland structure" as a type of histologic arrangement. This difficulty was solved by Ahlbom³ in the following manner: "We count as salivary tumors all those growths from the regions in question which used to be called adenoma, basalioma, mixed tumors (benign and malignant), cylindroma, endothelioma, papillary cystic salivary gland tumors, different types of carcinoma (epithelioma) and sarcoma." Long as this list may be, the group of typical mixed tumors is usually further subdivided into fibroepitheliomas, fibromyxomas, chondromas, etc.²

It is understandable that attempts should have been made to simplify this extended list of morphological types of salivary gland neoplasms. According to Ewing,²⁷ three groups

of epithelial tumors appear within the salivary glands: benign adenoma, malignant adenocarcinoma or carcinoma, and autochthonous mixed tumors, the latter group composed of myxochondrocarcinoma, basal-cell carcinoma with hyaline stroma, and adenoid cystic epithelioma. Stout⁸² believes that in the main only three groups of tumors appear within the salivary glands of the upper alimentary and respiratory tracts: adenoma (including cystoadenoma lymphomatosum), mixed tumors, and carcinoma. Willis⁸⁷ concedes that many of the formerly used names were convenient for descriptive purposes but feels that on the basis of histogenesis only the following subgroups should be distinguished: simple adenomas; pleomorphic adenomas and adenocarcinomas (so-called "mixed" tumors); anaplastic carcinomas; adenolymphomas.

Simultaneous with this tendency towards greater simplification of the histologic terms used in the description of salivary gland type tumors, there appeared a contrasting trend towards still greater differentiation. Dockerty and Mayo,²¹ for instance, distinguished four different types of histologic arrangement within that group of neoplasms hitherto labeled "mixed" tumors: 1. adenocarcinoma of mixed tumor type; 2. adenocarcinoma of cylindromatous type; 3. adenocarcinoma of intermediate form; 4. miscellaneous, *i.e.*, tumors which were difficult to classify under the foregoing headings. Stewart, Foote and Becker⁸¹ were able to differentiate on the basis of specific pathologic characteristics a subgroup, amounting to a little more than 5 per cent of all major and minor salivary gland tumors combined, which they named mucoepidermoid tumor of the salivary glands.

In this respect, a statistical evaluation of cases of tumors of salivary gland type within respiratory tract and ear — exclusive of the major salivary glands, and published during the past 20 years — may be of interest. Completeness of this survey was not intended and in numerous instances it proved impossible to ascertain whether duplication had slipped in. It is, however, hoped that the following statistical tabulation, incomplete as it may be, will provide an approximate idea of the prevailing opinions on the subject (see Table 1).

TABLE 1.

Histologic Classification of Tumors of the Minor Salivary Glands,
Published During the Past 20 Years; Four Additional Cases, Two of
Which Were the Author's Own, the Others Obtained Through
Personal Communications, Have Been Added.

Mixed tumors.....	244
Mixed tumors of parotid type.....	10
Cylindroma	118
Basalioma	4
Adenoma	2
Myeloma	2
Myoblastoma	5
Mucoepidermoid tumors	14
Endothelioma	12
Epithelioma	176
Carcinoma, mostly basal-cell carcinoma.....	32
Adenocarcinoma	228
Sarcoma	39
Not specified	252
Total number of cases.....	1,138

In a number of instances it proved necessary to simplify the published histologic diagnosis for the sake of statistical uniformity. For instance, a case diagnosed as "epithelioma adenoides cysticum, or cylindroma — a variety of basal cell carcinoma"³⁴ has been classified under "epithelioma"; similarly, a case described as "mixed tumor of salivary gland type, epithelioma adenoides cysticum"¹⁶ has also been classed as "epithelioma"; a tumor variously diagnosed as "myxochondroendothelioma, adenocarcinoma and cylindroma"⁶⁸ has been entered as "endothelioma." "Fibromyxoeipithelial tumors," as they often occur in Ahlbom's³ report, were counted as mixed tumors. Quite generally, cases were classified according to their major characteristics, while minor differentiations, as for instance, "encapsulated mucous and salivary gland tumor of the basalioma type with cylindromatous areas," could not be taken into consideration.

DISTINCTION BETWEEN BENIGN AND MALIGNANT TUMORS OF
SALIVARY GLAND TYPE.

As unsatisfactory as the histologic classification of tumors of salivary gland type is their distinction into neoplasms of benign or malignant character. The difficulties encountered in this respect are most aptly described by Stein and Geschickter:⁷⁹ "The benign neoplasms . . . often show malignant tendencies in that they recur frequently after simple excision, whereas the malignant tumors often show benign features in that distant metastases rarely develop. Whether recurrence in a given case is a clinical feature of a benign process or a malignant feature of a type of carcinoma in which a tendency to widespread metastases is practically absent is not always easily decided. The composition of the majority of these new growths, as seen through the microscope, is likewise difficult of interpretation."

It has consequently been suggested that the prognosis of a case should not be determined on the basis of histologic observations, but rather from the clinical history;⁷⁶ yet, many salivary gland growths produce only inconspicuous satellite tumor nodules nearby,² and recurrences may occur as late as 22 years,²⁶ or even 45 years,⁵⁷ after excision of the growth. The clinical determination of the character of a tumor of salivary type is equally beset with difficulties.

At the present time, the prevalent opinion seems to be that all tumors of salivary gland type are malignant in themselves, not by virtue of any sarcomatous or carcinomatous "degeneration,"⁸⁰ or that they are at least potentially malignant.³⁷ Stout⁸² apparently holds a divergent view, and Stewart, Foote and Becker⁸¹ maintain that a definite distinction into a "relatively favorable" and "highly unfavorable" group of tumors is possible merely on the basis of histologic findings. Benign salivary gland tumors are probably best described as "potentially malignant" neoplasms,⁵⁰ or as always malignant, though to widely varying degrees.⁸⁷

A statistical tabulation of the reviewed cases leads to a similar conclusion: of all instances in which the benign or

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malignant character had been identified, more than 75 per cent were described as malignant, though in a number of cases only as potentially or mildly malignant (see Table 2).

TABLE 2.

Distinction Between Benign and Malignant Neoplasms Among Tumors of the Minor Salivary Glands, Published During the Past 20 Years; Four Additional Cases, Two of Which Are the Author's Own, the Others Obtained Through Personal Communication, Have Been Added.

Benign	242
Questionably benign	8
Potentially malignant	98
Mildly malignant.....	24
Malignant	652
Not specified.....	114
Total number of cases.....	1,138

HISTOPATHOLOGY.

From the preceding review of the various classifications of minor salivary gland tumors, it becomes apparent that it is not feasible to describe all the different histological arrangements which may be encountered within these structures. The discussion will, therefore, have to be limited to three of the more characteristic patterns: mixed tumors, cylindromas and mucoepidermoid tumors.

According to Ewing²⁷ *mixed tumors* consist of zones of epithelial cells, and a mucinous ground-substance (see Fig. 3). The appearance of the epithelial portion ranges from that of adenomatous alveoli to strands or masses of small, flattened, compact epithelium of basal type. The mucoid tissue is usually most abundant in the central portions of the lobules. As a rule, cartilage cells are encountered, and collagen as well as elastic fibres may be distinguished. Squamous cells are often observed, together with fibrillation, intercellular bridges, pear formation and keratohyaline granules.

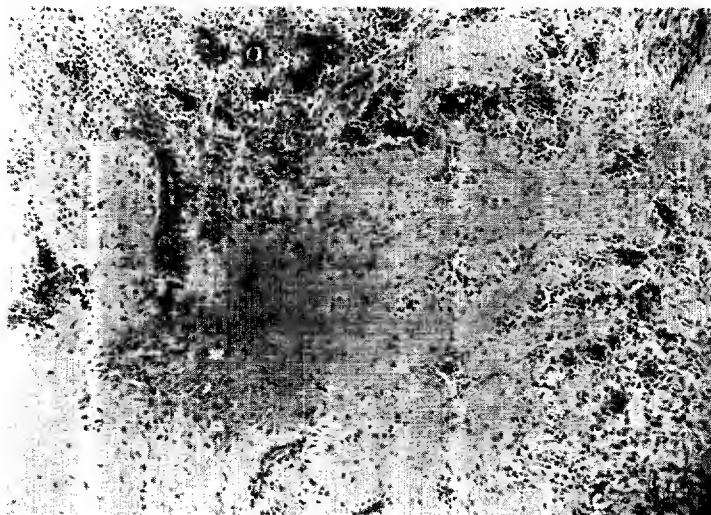


Fig. 3. Mixed tumor of salivary gland type. Epithelial cells in characteristic arrangement and mucinous ground substance. ($\times 120$.)

In other instances, mixed salivary tumors can be described as basal-cell carcinomas with hyaline stroma. Neoplasms of this type are composed of small, cuboid or spindle-shaped cells, with hyperchromatic nuclei, and arranged in cords or strands which fuse with the hyaline stroma.

In a number of salivary gland tumors, the epithelial cells show *cylindromatous* arrangement (see Fig. 4). The stroma of the tumor consists of coarse hyaline matter, arranged into more or less parallel bundles between which the cellular and glandular elements are compressed.⁵⁷ The coarse trabeculae of connective tissue may undergo mucoid degeneration.²⁷ The epithelial cells are small and dark staining, and are arranged in cylinders or plugs which honeycomb the stroma.²¹ The cellular arrangement resembles to a certain degree the adenocystic type of basal-cell carcinoma.

A third group of neoplasms, appearing within the various salivary glands, has been described by Stewart, Foote and Becker⁸¹ as *mucoepidermoid tumors* (see Fig. 5). They are characterized by the presence of numerous mucous cells, more

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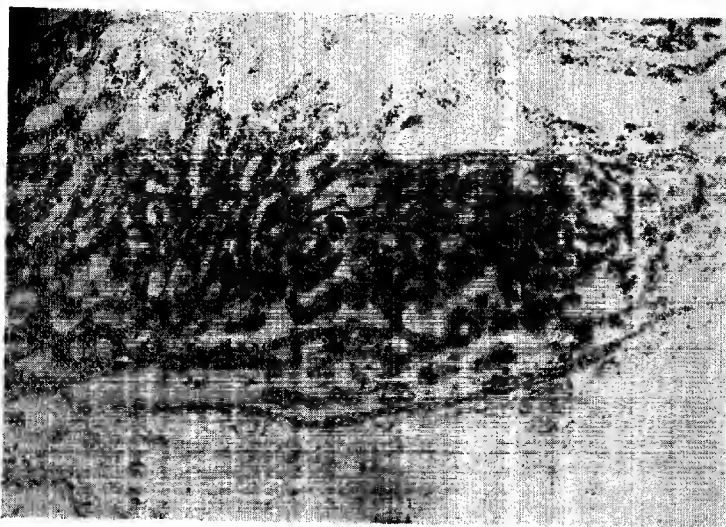


Fig. 4. Mixed tumor of salivary gland type. Cylindromatous arrangement of epithelial cells. ($\times 120$.)



Fig. 5. Mucoepidermoid tumor of salivary gland type. There is involvement of ducts near the center, surrounded by normal glandular tissue. ($\times 120$.)

frequent in benign than in malignant tumors. Sometimes entire areas of the tumor consist chiefly of mucous cells, and epidermoid cells are by no means as plentiful as those of the basal or "intermediate" type. One of the outstanding cytologic characteristics is epidermoid metaplasia occurring mainly in basal cells but also observed in mucous and columnar cells.

Benign tumors of the mucoepidermoid type are usually marked by pronounced multiplicity of cell types. If basal or "intermediate" cells predominate, a uniform mosaic pattern results, leading to a sheet-like arrangement. In regions where mucous cells prevail, small or dilated duct-like structures will be observed. Such cysts, filled with mucoid secretion ("mucus pools") appear in about 50 per cent of all benign tumors of this type. Dilatation of these cysts may take place, as well as erosion of lining epithelium, disruption of the basement membrane, and leakage into adjacent tissue, possibly resulting in necrosis. In about one-third of the number of benign tumors, the cells in certain areas are hydropic, swollen and filled with extraordinarily clear cytoplasm. Cells of this kind in alveolar or pseudoglandular arrangement simulate renal adenocarcinoma, and Stewart, Foote and Becker⁸¹ report that in one instance this similarity was so pronounced that "it was necessary to have assurance that there was no clinical evidence of renal neoplasm before making the diagnosis of mucoepidermoid salivary gland tumor."

Malignant tumors of the mucoepidermoid type are usually very diffusely overgrown and rather anaplastic. Generally epidermoid cells are predominant. The almost complete overgrowth of epidermoid or squamous cells gives at times the appearance of unicellular cancer of epidermoid or squamous type. Staining with mucicarmine will, however, demonstrate the presence of mucus. Malignant mucoepidermoid tumors show little tendency towards the formation of microcysts. Mucus pools, due to an overabundant production of mucus, are rarely, if ever, observed.

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CLINICAL FINDINGS.

Mixed tumors growing from the palate are as a rule firm and will at times obstruct the pharyngeal opening. In all tumors of salivary gland type, differences in consistence are due to variations in the connective tissue and cartilage content. In general the rate of growth is slow. Tumors of salivary type begin usually as a small submucous nodule, and grow within a capsule. On the average, the malignant variant is smaller than the benign tumors, and shows less tendency towards cyst formation. Localized pain is more often associated with malignant than with benign tumors and accompanies almost regularly neoplasms of cylindromatous structure. Swelling and tenderness are often observed. Salivary gland type tumors of the palate sometimes produce hemorrhage, or difficulty of deglutition; tumors of the tongue may lead to speech impairment. Most of the patients with tumors in the paranasal sinuses complain of nasal blockage, pain, nose bleed or nasal discharge as first symptoms. Tumors originating within the external auditory canal or in the middle ear may lead to impairment of hearing and to Roentgenologically demonstrable bony changes. Malignant mucoepidermoid tumors often produce mucosal ulceration, as well as erosion and penetration of adjacent bony structures.

SEX.

A statistical tabulation of the same material as mentioned earlier in this report showed that 489 of the patients with minor salivary gland tumors were males, 192 were females, while in 457 instances the sex of the patient was not indicated.

New and Childrey⁶¹ reported 87.7 per cent of male patients in their series of 357 cases. In the series of Ahlbom,³ on the other hand, which includes major as well as minor salivary gland tumors, there occurred a marked predominance of female patients (65 per cent). According to Stewart, Foote and Becker,⁸¹ sex is no factor in mucoepidermoid tumors, and benign as well as malignant neoplasms occurred with approxi-

mately equal frequency in male and female patients. It has, however, to be added that total figures of these last named authors also include patients with tumors of the major salivary glands. The remark by Willis⁸⁷ seems, therefore, entirely warranted, that there is but little difference between the sexes in their liability to salivary tumors.

AGE.

The age of patients was mentioned in only a small number of cases, and the average figure calculated on that basis, 44.2 years, may be of no great statistical value. The extreme ages in this series were 13 and 87 years, respectively. New and Childrey's⁸⁸ series with a slightly higher average age (45.5 years) included patients as young as four and as old as 80 years. The average age of Ahlbom's³ patients with tumors of the minor salivary glands was 47.8 years.

All authors agree that the average age of patients with malignant tumors is considerably higher than that of persons with benign neoplasms. There is no reason why this finding in groups which include tumors of the major as well as the minor salivary glands should not apply also to a series limited to the latter location.

SITE OF PRIMARY LESION.

In 414 cases reported in the 82 papers on which the present statistical survey is mainly based, the site of lesion was not sufficiently identified. In the rest of the material, the *palate*, including hard as well as soft palate, was most often the location of the growth. This finding is in agreement with the results of every other published series, and in all instances palatine growths were more abundant than minor salivary gland tumors in any other site; however, in the present tabulation, tumors of the palate were comparatively less frequent than reported in the smaller groups of Willis⁸⁷ and Ahlbom.³ Benign⁸⁵ or malignant^{80,86} tumors of the hard palate may invade the paranasal sinuses, or the nasal cavity proper. In other instances, the growth may infiltrate into the faucial

pillar.²⁶ As squamous cell carcinoma is relatively rare within the hard and soft palate, while tumors of salivary gland type are comparatively frequent, their possible presence should always be taken into consideration in the differential diagnosis of neoplasms encountered in that area (see Table 3).

TABLE 3.

Primary Site of Tumors of the Minor Salivary Glands, Published During the Past 20 Years; Four Additional Cases, Two of Which are the Author's Own, the Others Obtained Through Personal Communication, Have Been Added.

Hard and soft palate.....	264
Nose	84
Pharynx	73
Lip	59
Paranasal sinuses.....	44
Trachea	41
Tongue	38
Cheek	36
Tonsillar region	18
Floor of mouth.....	18
Glottic area and larynx.....	14
External ear canal and middle ear.....	13
Gums	11
Bronchi	7
Not specified.....	414
Total number of cases.....	1,138

Next to the palate, minor salivary gland tumors were most frequently encountered in the *nasal cavity* (84 times). A similarly large percentage of nasal tumors has been reported by McDonald and Havens.⁵⁴ One tumor of the upper septal region recurred five times within four years, but never proceeded to metastases or local invasion;¹⁰ another case involving the right nasal cavity as well as the floor of the antrum produced four localized recurrences.⁴⁴

The mucosa of the *pharynx* was the original site of the tumor in 73 cases. In one instance, the growth was so large that it extended from the ear to the thyroid cartilage; several other tumors had eroded cervical vertebrae.⁶⁰ Origin within or about the Eustachian orifice is especially noted in one instance.⁴¹

Salivary gland tumors of the *lip* were noted in 59 cases, apparently oftener in the upper than in the lower lip.

In the *paranasal sinuses* there occurred 44 cases, two-thirds of which are reported by McDonald and Havens.⁵⁴ Recurrent tumors of the antrum may invade the palate,⁷ and as at the same time tumors of the palate may proceed to erosion of adjacent bone,⁷¹ it is sometimes difficult to decide where the complex growth had originated.

More than 5 per cent of all minor salivary gland tumors in which the location was sufficiently specified or, to be precise, 41 cases, occurred within the *trachea*. This is considerably more than in the larynx and glottic areas, a fact which is confirmed by the observation of Ahlbom.³ The greater number of instances of minor salivary gland tumors within the trachea has been reported by McDonald,⁵³ who submitted 27 cases from the records of the Mayo Clinic. Sixteen of the patients were males, 11 females; the youngest was 29, the oldest 70 years of age. Histologically, all tumors were considered to be malignant, though to varying degrees. Squamous cell carcinoma was most frequently encountered (11 times), the remainder consisting of cylindromas (eight), adenocarcinomas (six) and hemangioendotheliomas. A basalioma of the subglottic-tracheal area, which was classified as "benign," recurred 11 years after excision, and at that time three different growths appeared, causing almost complete obstruction.⁵ Tracheal tumors sometimes attain to a very large size, as for instance an epithelioma adenoides cysticum, which extended from the subglottic region to the point of origin of the right bronchus.³⁴ In other instances, tracheal cylindromas arose close to the bifurcation and proceeded to involve one or both bronchi.⁵⁵

A survey of the literature shows that salivary gland type tumors were observed 38 times within the mucosa of the *tongue*. Fifteen cases were reported by McDonald and Havens,⁵⁴ all of which were considered to be malignant. The histologic diagnosis was cylindroma in seven instances, adenocarcinoma in six instances, while mixed tumors were noted twice. In a series of 11 tumors of salivary gland type within the tongue, Brunschwig¹² found seven neoplasms situated within the base, while in Ahlbom's³ much smaller series of four cases, all tumors were encountered in this location. The great danger of malignant neoplasms arising at that site is well illustrated by a pseudoadenomatous basal cell carcinoma which had developed in a salivary gland at the base of the tongue: the tumor spread locally so far as to almost close the right side of the pharynx, while at the same time metastases to the cervical lymph nodes as well as to the lungs and the femur occurred.⁴⁶

Salivary gland type tumors of the *cheek* have been reported in 36 instances, the greatest part by McDonald and Havens.⁵⁴ Their series consists of an equal number of mixed tumors and adenocarcinomas, and of a few cylindromas. Attempts have been made to distinguish the buccal glands from which these neoplasms spring, and it may be assumed that the greatest part arises either from the accessory parotid or from the adjacent molar glands.

The *tonsillar region* is noted as the origin of salivary gland type tumors in 22 instances. Such neoplasms often extend to involve the lateral pharyngeal wall,^{28,51} or may reach the base of the epiglottis.⁸⁹

The *floor of the mouth* is the region of origin in 18 cases, almost all reported by McDonald and Havens,⁵⁴ who found that cylindromas are more numerous than adenocarcinomas or mixed tumors.

Salivary gland tumors are rare in *glottic area and larynx* (14 cases). It is noteworthy that neoplasms of this type are most frequently encountered in the subglottic area, near the

border of the upper trachea. Tumors in this latter location have been classified by Ahlbom³ as tracheal growths. Resultant tracheal obstruction may sometimes simulate asthma.⁴¹

Primary tumors of salivary gland type are so rare within the ear that it may be of interest to report the specific origin where they have been recorded in the literature. Such neoplasms are most frequent within the external auditory meatus and may even extend into the middle ear.⁴ One tumor was reported near the opening of the Eustachian tube, another was attached to the inner tympanic wall.¹³ Salivary gland tumors in the region of the ear are oftentimes pedunculated.³⁹ A granular cell myoblastoma, fixed to the wall of the inner part of the external ear canal, recurred after it had been removed nine times by surgery.⁴

Within the oral cavity, tumors of salivary gland type were least frequently observed in the gums (11 times). Malignant mucoepidermoid tumors appeared twice in the alveolar ridge.⁸¹ A tumor of the angle of the left jaw, variously diagnosed as myxochondroendothelioma, adenocarcinoma or cylindroma, recurred after 29 years.⁵⁸

Only seven instances of minor salivary gland tumors of the bronchi are on record. All these neoplasms were classified as cylindromas, and in some cases the tumor grew to involve the upper lobe of the lung.

CASE REPORTS.

Case 1: F. O., male, white, age 60 years, was first seen on May 8, 1948. The patient complained of sore throat and pain radiating to the right side of the face, of two days' duration. He also had a dry, hacking cough and pain in the chest. Patient had been a pipe smoker for 43 years. Examination revealed an old, central perforation of the right tympanic membrane. The left tympanic membrane was clear. The nasal septum showed considerable deviation to the right without, however, causing great obstruction. The nasopharyngeal mucosa was hyperemic, but no masses were seen. The sinuses appeared clear upon transillumination. Leucoplakic areas were discovered in the mucosa of the cheeks and also in soft and hard palate. On the left side of the soft palate, a firm, nontender nodule was encountered under the mucosa. The vocal cords moved normally and there were no masses in the larynx. First impression: leucoplakia of the mouth; tumor of the palate, possibly malignant. Upon removal on June 26 the tumor was seen to involve the entire left half of

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the soft palate, extending anteriorly to the junction of the soft and hard palate. The mass was not too well encapsulated and had to be removed in several pieces. The wound healed per primam and at time of writing there has been no recurrence.

The specimen submitted for pathologic examination consisted of a dozen or more irregular pieces of tissue of yellowish mucoid appearance; the largest fragment measured 12 x 7 x 10 mm. Microscopic examination showed the neoplasm to be composed of small cells, partly undifferentiated and partly of tubular shape. Colloid-like inclusions were frequently observed within these tubules. The undifferentiated cells tended to merge with a myxoid stroma, which in some places was of hyaline appearance; however, tubular or duct-like structures predominated, while the stroma was relatively scarce. In one area a large duct was surrounded by papillary ridges of stroma; in other places the epithelium of ductules tended to infiltrate the deeper layers of connective tissue. Parts of several specimens exhibited normal salivary gland structure. Most of this tumor appeared to be benign, but propensity for recurrence had to be taken into consideration. Adenomatous structure predominated within the tumor. *Diagnosis:* Salivary gland tumor (see Figs. 6 and 7).

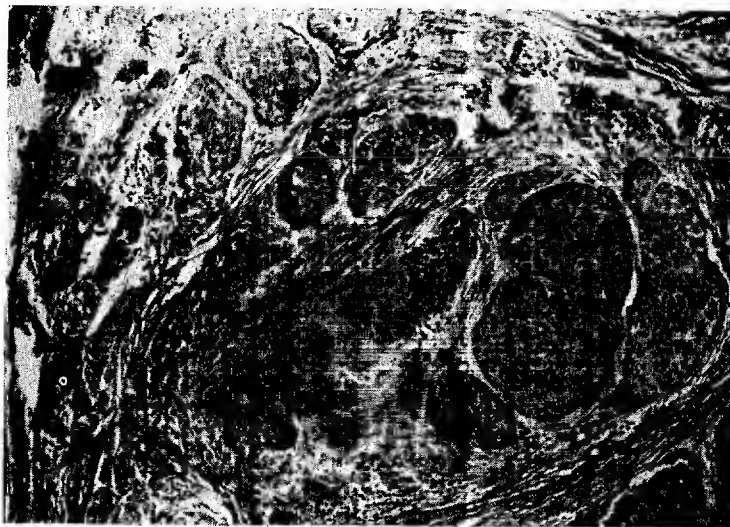


Fig. 6. Mixed tumor of the palate. Case 1. Alveolar arrangement of cells and myxomatous character of stroma. ($\times 120$.)

Case 2: V. W., female, white, 43 years of age, was first seen on Nov. 7, 1947. The patient complained of sore throat of two years' duration; intermittent hoarseness during the past 12 months; dyspnea progressively increasing in the course of the past year. The patient had been in good health all her life. *Physical Examination:* Ears, nose and upper respiratory passages were normal. Mirror examination of the larynx demonstrated two large polypoid granular masses located underneath the left cord in the posterior portion of the larynx. *Initial Impression:* Poly-



Fig. 7. Mixed tumor of the palate. Case 1. In the left center, cystic degeneration is apparent, while in the upper center, basal cells with pearl formation are seen. ($\times 210$.)

poid granuloma of the subglottic region. Direct laryngoscopy was performed on the same day, and the tumor was removed. In addition to the two large polypoid tumors, a more sessile accumulation of tissue was encountered, extending to the anterior wall of the larynx in the subglottic region.

Direct laryngoscopy was repeated two weeks later, at which time the area from which the tumors had been excised was fulgurated. Again, one week later, the larynx was examined and found to be in good condition.

Histologic Examination: The tumor consisted of gland-like spaces, often distorted by papillary structures. For the most part, these spaces were lined by two or more layers of cells, resembling cuboidal epithelium. When only two layers were present, the epithelium showed fairly orderly arrangement. The cytoplasm stained lightly, the nuclei took the stain rather evenly, while the nucleoli were barely visible. There existed hardly any indication of mitotic activity. The gland-like spaces often contained basophilic material, resembling mucus. In the tissue spaces between these gland-like structures, there appeared abundant evidence of proliferation of somewhat different cells. These cells were mostly of oval shape, but sometimes also stellate, and thus similar to the so-called undifferentiated cells of mixed tumors; no definite pattern could be recognized in the arrangement of these cells. Moderate leucocytic infiltration was noted. In some areas there occurred vacuolization of the cytoplasm as evidence in the signet-like shape which the nuclei had assumed under compression. This appearance was taken to be due either to intracellular mucinous secretion or to degeneration. The stroma had the form of elongated, twisted cords of hyaline material. Two diagnostic possibilities suggested themselves: mixed tumor akin to the mixed tumors of

salivary gland origin and occasionally seen in the mouth or in portions of the respiratory tract; or papillary adenoma of mucous gland origin. The first possibility seemed more likely. The tumor was considered to be benign but capable of local recurrence and aggressive growth (see Fig. 8).



Fig. 8. Mixed tumor of the larynx. Case 2. Cylindromatous arrangement of cells can be observed. ($\times 210$.)

SUMMARY.

Tumors of the minor salivary glands are more frequently encountered than is usually assumed. A comprehensive but by no means complete review of the literature of the past 20 years revealed 1,138 published cases. History, histological classification and histopathology of minor salivary gland tumors are discussed. The clinical characteristics, especially the site of the primary lesion, are reported on the basis of a statistical evaluation of the bibliographic material. Two cases are presented and a third one is briefly reviewed, which, though diagnosed as mixed tumor of salivary gland type, was proved at autopsy to have been the metastasis of a hypernephroma.

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ENDAURAL SURGERY OF THE TEMPORAL BONE.*

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For the past three years the endaural technique, as outlined by Lempert,^{1,2} has been used exclusively in all temporal bone surgery at the Bethesda Naval Hospital, with which I have been closely associated in the capacity of consultant in otolaryngology. During this period there have been over 100 major operations performed by the endaural method, including complete mastoidectomies (simple mastoidectomy); atticomastoidectomies (modified radical mastoidectomy); tympanomastoidectomies (radical mastoidectomy), resection of osteoma of the external auditory canal adjacent to the drum; repair to the facial nerve; repair of postauricular defects, and fenestrations of the external semicircular canal for otosclerosis. In all of these procedures, the technique of Lempert has been followed meticulously. It is my purpose to review briefly the development of the technique and to outline some of its advantages and disadvantages.

The development of temporal bone surgery has proceeded very slowly since Riolan,¹⁸ in 1649, recommended opening the mastoid process to relieve deafness caused by Eustachian tube destruction. Little enthusiasm developed for this procedure, and very little progress was made for over a century. Certain events maintained interest in otologic surgery, however, and their importance must not be lightly dismissed. The catheterization of the Eustachian tube, in 1724, by Guyot was signifi-

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cant. The performance of mastoidectomy, with successful result, by Petit, in 1760, gave considerable impetus to the lagging interest of the day. Paracentesis of the eardrum, to relieve deafness, performed in 1788 by Cooper, of England, did not accomplish its mission, but it did help to focus attention on the eardrum and the middle ear. In the latter part of the eighteenth century a serious setback was experienced when mastoidectomy, performed for the relief of tinnitus and deafness, resulted in the death of the royal physician to the Danish King. It was not until the decade 1860-1870 that surgical drainage of the mastoid process was placed on a definite acceptable plane by the brilliant efforts of von Troltsch, Lucke and Follin. The actual origin of present day mastoid surgery should probably be credited to France. While its early development was fostered by Germany and Holland, its latter day growth was encouraged by the work of the Englishmen, Wilde and Toynbee, and its twentieth century improvements have been largely the result of American ingenuity.

In 1873, mastoidectomy was first specifically recommended as the treatment for suppuration in the temporal bone. Schwartze described the operation and gave the indications for its use. His description became the accepted standard until 1905, when Whiting published his classical work. In 1910, Reik introduced the blood clot method of healing of the postauricular wound, closing the postauricular soft tissues tightly. This method fell into disrepute because of frequent infection of the blood clot with no available drainage. Since then the teachings and publications of such men as McKernon, Kerrison, Phillips, Rae, Dench, Duel, Coates and many others have added greatly to the development of surgical technique in the treatment of mastoid suppuration. The most recent contributions have been offered by Lempert and his followers in the perfection of the endaural approach to the mastoid.

The endaural attack on the temporal bone was attempted many years ago, but the incisions were usually made through skin, fibrous tissue and cartilage indiscriminately, so that considerable postoperative atresia and adhesions were likely to

develop. In 1875, several papers were written on the endaural approach to the middle ear and auditory ossicles for the relief of deafness and tinnitus. Kessel, of Jena, was a pioneer in this work. He was followed by Schwartz, Schroeder, Panse and Jack. In 1887, Stacke attacked the endaural approach because he felt it allowed only a small field of operation. Improvements in endaural technique were gradually evolved by Kessel, who was able to remove the entire lateral wall of the attic with burr and curette in the last decade of the nineteenth century. In 1900, Gompertz reported on the use of local anesthesia in endaural operations. In 1904, von Eicken improved local anesthesia by adding adrenalin to the anesthetic agent. Thies performed the first radical mastoidectomy by the endaural method in 1907. Essen reviewed the endaural work of Thies and, in 1921, published his own findings and modifications.

In 1926, Dr. Julius Lempert, of New York, who had performed 1,500 mastoidectomies by the postauricular method of Schwartz, began to use the endaural approach to the temporal bone. His classical incisions in the extracartilaginous portions of the external auditory canal are the result of much trial and error experimentation on the cadaver over a period of years. By devoting his entire time to the perfection of the endaural method of otologic surgery, Lempert⁴ has been able to evolve his three simple incisions that are now so well known. By removing a small triangle of the skin and subcutaneous tissues enclosed in these incisions and mobilizing the antauricular window which is thereby produced, it is possible to gain access to any portion of the temporal bone that requires surgical treatment. Several modifications of the endaural incisions have been suggested by Shambaugh^{14,21} and others for various reasons.

The advantages of the endaural approach can be fully shared only by those who learn all of the technical minutiae that have been developed. Preliminary instruction on the cadaver under competent supervision is one of the first requirements. A knowledge of the minute anatomy of the tem-

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poral bone and its relations are an acknowledged prerequisite. The use of intense illumination provided by an approved type of headlight is important. Adequate irrigation and suction apparatus is necessary to maintain a clear operative field. Magnification is essential for appropriate treatment of disease in the middle ear and for the creation of fenestra in the semi-circular canal. The use of sharp cutting burrs in removing the mastoid cortex probably eliminates a good deal of the trauma to the brain which could be produced by mallet and gouge, while it allows greater accuracy in performing this step of the operation. The emphasis placed on the use of long-handled sharp curettes as delicate cutting instruments rather than as scoops makes for greater precision in operating; however, the special technique can be mastered only after giving it considerable study and effort, and a rather generous expenditure of money is required for the highly specialized equipment.

To justify the extra time and expense required to learn the endaural technique, there are certain advantages which it offers over the postauricular method of attack:

1. It affords the most direct avenue of surgical attack on the external auditory canal, mastoid antrum and cells, aditus and epitympanum, labyrinth, zygomatic area, middle ear, facial nerve, lateral sinus, dura of middle and posterior fossae, and the petrous apex.
2. There is less trauma to the soft parts.
3. There is no postoperative perichondritis or myositis, if the incisions are properly made.
4. Postoperative inspection of the mastoid cavity is facilitated, and treatments are simplified.
5. Excellent drainage is maintained for as long as is necessary.
6. The postoperative period of disability is shortened.
7. The cosmetic scar is minimal.

There is a certain feeling of accomplishment enjoyed by the otologist who has performed a tympanomastoidectomy through the endaural incisions, using electrically driven burrs and sharp currettes. The gradual uncovering of each landmark of importance, the systematic eradication of every possible area of necrosis and infection, and the ease with which one can convert a mastoidectomy into an atticomastoidectomy, or a tympanomastoidectomy, or further into a labyrinthectomy or apicectomy, all combine to give the surgeon a profound feeling of satisfaction in the execution of his surgery.

In teaching the endaural technique to residents it has been gratifying to watch their evolution from timid scratchers of the cortex to confident operators, who are not afraid to explore any area once they know its contents and can see its deepest recesses. No effort is made to develop speed, and safety is made to depend solely on an intimate knowledge of the anatomy of the part. Each resident is shown the postauricular method on the cadaver, but none of them have shown any *inclination to prefer* this method over the antauricular approach. The classical Schwartze tympanomastoidectomy (radical) is performed at least once during the year with gouges, rongeurs, chisels and standard curettes by every resident, after he has learned the endaural technique thoroughly. This is done because the special equipment normally used in endaural surgery is not available in all naval hospitals and hospital ships.

A detailed account of all cases operated upon by the endaural method is not called for in a presentation of this kind. It is sufficient to state that there were in all two complete mastoidectomies (simple); 11 atticomastoidectomies (modified radical); over 50 tympanomastoidectomies (radical); 50 fenestrations of the labyrinth for otosclerosis; three revisions of fenestrations; and two resections of osteoma of the bony external auditory canal for atresia, included among the endaural procedures performed during the past three years. As the experience of the operator increased in each instance his ability increased and his surgical horizon broadened, so that

more and more conditions in the temporal bone became readily accessible through the endaural approach. With increased ability, there was a noticeable reduction in troublesome bleeding, a much wider exposure of the working area could be obtained as needed, and the postoperative course became much smoother for the patient.

Complications following endaural procedures have been very few. There have been three temporary facial palsies, one apparently caused by tight packing over a skin graft on the lowered facial ridge, and two caused by lowering the facial ridge too far with a cutting burr. The heat of the burr probably caused the paresis. All three cases recovered. Our greatest difficulty has been experienced in controlling exuberant granulations in the middle ear until epithelial ingrowth could occur following tympanomastoidectomy. The judicious use of split thickness skin grafts helps to overcome this. We are still troubled by our inability to cope adequately with necrotic granulations covering the stapes in the oval window, and concealing the niche of the round window. It is possible that removal of this necrotic tissue would allow improvement in hearing, but the risk involved in working over the stapes is too great. The accidental removal of the stapes during an attempt to tease necrotic tissue out of the posterosuperior portion of the middle ear had a dampening effect on our early enthusiasm for the removal of all diseased tissue regardless of its location. Too much zeal in curetting granulations out of the hypotympanum resulted in brisk oozing from the jugular bulb in another early case. Surprisingly enough, neither of these accidents caused any change in the usual postoperative course, probably because penicillin chemotherapy was employed for 10 days postoperatively. Increasing familiarity with the appearance of the middle ear in various pathological conditions has precluded any untoward accidents in the past 50 cases.

During this modern era in the history of otologic surgery, when chemotherapy has reduced the incidence of surgical mastoiditis to the lowest percentage it has ever attained, it becomes doubly necessary to train the younger otologists thor-

oughly in temporal bone surgery during their residency years, since it is likely that their opportunities to keep their hands in operative surgery will be few and far between after they finish their training. It is my opinion that the best training can be offered through the teaching of the endaural technique, since the primary requirement for learning the method is a thorough knowledge of the anatomy of the temporal bone.

The second part of this paper is being devoted to a discussion of the original 25 cases of clinical otosclerosis which were operated upon at the Bethesda Naval Hospital between April, 1946, and July, 1947. The presentation of the poor early results from this type of aural rehabilitation surgery may cause a stir of disapproval among my more conservative colleagues in otology, but, on the other hand, it can also be used as a measuring stick by those who have not yet attempted this type of surgery. For the average otologic surgeon, the marvelous results obtained in selected cases at the larger clinics by such outstanding men as Lempert, Shambaugh and House are probably not attainable. In a moderately busy practice there will not be more than 300 cases of surgical clinical otosclerosis available in the entire life span of the practicing otologist. In such a small series, there cannot be too many disappointments, or the surgeon will soon become discouraged and will abandon the procedure because of the unfavorable publicity it gives him in his community. It may be encouraging, therefore, to discuss the trials and tribulations encountered in my early experience with otosclerosis surgery so that the mistakes will not be repeated by others. The operation is now so well established and accepted as the only definitive approach to practical rehabilitation in stapes fixation deafness that it behooves all otologists to become familiar with the technique, regardless of the disappointments experienced in some of the first few cases. Perhaps the publishing of the results in this small series of operated cases will serve as a stimulus to those whose early experiences have been anything but pleasant and who are ready to abandon the procedure. Keeping in mind the old adage that "misery loves company," I will offer the results of my early endeavors as a

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weeping wall for the faltering fenestrators whose enthusiasm has been badly dampened by a comparison of their results with the published results of the brilliant leaders in the work.

The diagnosis of otosclerosis was made in each of our operated cases on the basis of family history, absence of history of otorrhea, progressive hearing loss with no obvious cause, such as nasal or nasopharyngeal pathology, conduction type of deafness, and normal otoscopic and X-ray. Good bone conduction was a necessary requirement but losses up to 30 db. were considered within the acceptable limits in the early cases. At the present time, a loss of 20 or more decibels by bone for the speech frequencies is considered an unfavorable omen. Soon after starting the work, it became apparent that post-operative hearing gains were sometimes delayed beyond the two or three-week period, even though an excellent reception of a low whisper was obtained on the table. Considerable anxiety on the part of patient and surgeon was acquired, and no time limit was set for the clinical improvement to occur. Reliance had to be placed on the findings during operation, the observed hearing improvement on the table, and the knowledge that all accepted technical steps had been followed in some cases a considerable pure tone audiometric improvement could be shown, but a practical improvement in hearing for conversational voice was not obtained. This disappointing finding forced us to adopt the routine preoperative testing of speech intelligibility following the advice of Meltzer. This test helps to eliminate from consideration those patients who can "hear but can't understand." If speech intelligibility cannot be improved at any intensity prior to operation, then surgery will not be of much help.

Considerable confusion was caused during the early days of this work by the patient whose responses seemed too good to be true. I refer to those patients with a conductive type of loss in excess of 45 db. by air in both ears, whose bone conduction curve was normal prior to the operation. The poorer hearing ear by air conduction would be selected for surgery, providing the masked bone conduction was good, and in a

fair number of cases the postoperative gain was substantial by audiometry and amazingly good subjectively. The tremendous subjective improvement in one or two such cases aroused our suspicions concerning the validity of the preoperative audiograms. Careful rechecking revealed improvement in the unoperated as well as the operated ear, forcing us to conclude that the patient's anxiety for surgery had caused him to give unreliable preoperative hearing curves. This led to the development of a higher index of suspicion in the mind of the examiner when any preoperative hearing curve was "too typical to be true." In such cases the facilities of the nearby Forest Glen Aural Rehabilitation Center of the U. S. Army were made use of, and the malingering tests of Glorig were applied to eliminate the overanxious patient whose hearing level was better than he would admit. It has been my experience that persons who are impressed with their hearing loss, and who have been told by competent otologists that they are not yet sufficiently hard of hearing to require fenestration surgery, have a tendency to exaggerate their hearing loss by audiometry in the speech frequencies. This type of patient has apparently made up his mind that the only thing that will help him is a fenestration operation, and he continues to make the rounds of the various otologists who do this type of surgery until he can convince one that his hearing loss is of the type that can be benefited by fenestration. Operating such a patient leads to nothing but grief. The postoperative result in the operated ear is poor, but the unoperated ear may show a hearing gain up to the 30 db. level in the speech frequencies. It is only after he has operated upon one of these patients that the neophyte in fenestration surgery learns that the hard-of-hearing patient is an excellent salesman who occasionally deceives his otologist about the severity of his hearing loss. By the same process the ophthalmologist of limited experience may learn to his sorrow that the unoperated eye of his cataract patient, which could see no better than 20/100 before operation, is able to see 20/30 postoperatively, whereas the best corrected vision of the operated eye is 20/40. Such

experiences with patients who are anxious to be operated upon cause the surgeon to become more and more cautious in selecting his cases for surgical treatment.

As we have gained greater experience in the surgical treatment of otosclerosis, it has become apparent to us that the most important phase of our work is the preoperative evaluation of the patient. No reliance can be placed on a test of bone conduction unless adequate masking is used. At least two audiometers must be available for testing purposes so that one can be sent out for standardization at regular intervals. An audiometer cannot be sent through the usual shipping channels without great hazard. If at all possible, the machine should be delivered by reliable messenger to the repair station. If this cannot be done, the audiometer should be checked, after being repaired, against known normals as soon as it is returned to the otologist. Our audiometers have been found to be 15 to 20 db. off, in certain frequencies, immediately following their return from the factory.

In using the modern audiometer, it is advisable to note the limits of intensity advised by the manufacturer for the various frequencies. The small numbers embossed on the dial under the designation of the frequency being tested is the limit beyond which it is useless to go. For instance, under the 4096 frequency the small number 80 should be heeded, so that we will not turn the intensity indicator beyond 80, if the machine is well calibrated. Some patients will fail to indicate that they hear this frequency until an intensity of 90 db. is reached, but if we place the receiver against our own ear we can detect no difference in reception of the tone after the level of 80 db. has been exceeded.

Tuning forks of good quality should always be standardized by the otologist himself on known normals before they are used for the quantitative diagnosis of deafness. In our hands, tuning forks have been relied upon chiefly for a qualitative diagnosis of the type of hearing loss. As a routine we employ the Weber, Rinne, Bonier, Schwabach and Gellé tests. We have found that little reliance can be placed on the Gellé test

for determining whether or not stapes fixation has occurred. Apparently many degrees of stapes fixation can exist in otosclerosis.

With these preliminary remarks as an introduction, we will offer pre- and postoperative findings in our first 25 cases of surgical otosclerosis.

Case 1: Our first fenestration operation was performed on April 24, 1946, on a 28-year-old white male petty officer who had first noted hearing loss three or four years previously while in battle in the South Pacific. Preoperative audiograms revealed an average loss of 38.3 db. for the three speech frequencies by air and of 8.3 db. by bone in the poorer ear. On the table he heard a low whisper at 10 feet, but the postoperative audiogram on the operated ear had dropped to an average loss of 48.3 db. by air for the speech frequencies at the time of discharge from the service, June 1, 1946.

Case 2: D. L., 22-year-old white male petty officer, U. S. Navy, complained of bilateral hearing loss and tinnitus, first noted in combat two years previously. Preoperative audiograms revealed an average loss of 56.6 db. by air and of 16.6 db. by bone for the poorer ear. On the table he heard a low whisper at 10 feet, but the postoperative audiograms had shown a drop to an average loss of 48.3 db. for the speech frequencies four months later at the time of discharge from the service. While this represents an improvement on paper, it must be classified as an unsuccessful result from a practical point of view.

Case 3: M. L., 25-year-old, white female petty officer, U. S. Navy, first noted bilateral hearing loss and tinnitus two years previously. She had never been exposed to a noisy environment. Her preoperative audiograms revealed an average loss of 41.6 db. by air and of 13.3 db. by bone for the critical speech frequencies. Speech reception was good for low whisper on the operating table, and her postoperative audiograms at discharge in August, 1946, showed an average loss of 15 db. by air for the speech frequencies, showing an average improvement of 26 db., and allowing serviceable practical hearing. This case was our first successful one and brought the percentage of successful results from zero up to 33.

Case 4: A 23-year-old, white male petty officer of the U. S. Coast Guard, had first noted bilateral hearing loss and tinnitus four years previously during exposure to gunfire. His preoperative audiograms showed an average loss of 55 db. by air and 13.3 db. by bone for the speech frequencies. A low whisper was heard on the operating table, and the first postoperative audiograms revealed an average loss of 31.6 db. for the speech frequencies, showing a gain of better than 20 db. This gain slowly receded to the extent that an audiogram taken two months postoperatively showed an average loss of 38.3 db. for the speech frequencies, and at discharge three months postoperatively, the hearing loss for speech had returned to the preoperative level.

Case 5: H. G., navy nurse, aged 30, first noted bilateral hearing loss and unilateral tinnitus at age of 27. Preoperative audiograms revealed an average loss of 40 db. by air and of 8.3 db. by bone for the speech frequencies in the worse ear. A low whisper was heard at 10 feet on the

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operating table. Postoperative audiograms revealed an average loss of 23.3 db. by air for the operated ear, showing a gain of 16.7 db. This gain had been maintained up to November, 1948.

Case 6: Mrs. E. G., white, 32-year-old wife of an enlisted man, U. S. Navy, first noted bilateral hearing loss three years previously. Preoperative audiograms revealed an average loss of 46.6 db. by air and of 20 db. by bone for the speech frequencies in the poorer ear. There was a 30 db. loss by bone for the 2048 frequency and a 40 db. loss by bone for the 4096 frequency. On the operating table a low whisper was heard, but postoperative audiograms at the time of discharge showed an average loss of 40 db. by air for the speech frequencies. The 2048 frequency had dropped to 55 db., and speech reception was poorer than before operation.

Case 7: J. C., 18-year-old white seaman, U. S. Navy, first noted hearing loss at age 15. Preoperative audiogram revealed an average loss of 46.6 db. by air and of 10 db. by bone for the speech frequencies in the poorer ear. Postoperative audiograms revealed an average loss of 25 db. by air for the speech frequencies in the operated ear, representing an average gain of 21.6 db., at the time of return to duty two months postoperatively.

Case 8: D. L., white male, 22-year-old ships' cook, U. S. Navy, first noticed hearing loss at age 20 while exposed to gunfire. Preoperative audiograms revealed an average loss of 56.6 db. by air and of 16.6 db. by bone for the speech frequencies. Postoperative audiograms at first showed substantial gains, but at the time of discharge from the service four months later, the average loss had receded to 48.3 db. by air, indicating a poor result for all practical purposes.

Case 9: W. S., white male, 22-year-old technical sergeant, U. S. Marine Corps, had first noticed hearing loss and tinnitus at age 18. Preoperative audiograms revealed an average loss of 48.3 db. by air and of 6.6 db. by bone for the speech frequencies in the poorer ear. Postoperative audiograms at the time of return to duty revealed an average loss by air of 18.1 db. for the speech frequencies in the operated ear, representing a gain of 30 db.

Case 10: J. G., white male, 18-year-old seaman, U. S. Navy, first noted hearing loss and tinnitus at age 15. Preoperative audiograms revealed an average loss of 35 db. by air and of 5 db. by bone for the speech frequencies in the right ear, with similar loss for air in the left, but with poorer bone conduction in the left ear. This patient revealed a promontory blush on otoscopy, and his speech reception was poorer than his audiometric loss would indicate. At operation, however, a low whisper was understood after the fenestra had been created, and postoperative audiograms were satisfactory, revealing an average loss of 21.6 db. by air for the speech frequencies at the time of return to duty two months later.

Case 11: E. Z., white male, 31-year-old private, U. S. Marine Corps, had first noted hearing loss four years previously. Preoperative audiograms revealed an average loss of 55 db. by air and of 26.6 db. by bone conduction for the speech frequencies in the poorer ear. Postoperative audiograms revealed an average loss of 28.3 db. by air in the same frequencies at the time of discharge from the service six weeks later.

Case 12: E. B., white female, 26-year-old chief yeoman, U. S. Navy, had first noted hearing loss at age 22. Preoperative audiograms revealed an average loss of 43.3 db. by air and of 15 db. by bone for the speech fre-

quencies in the poorer ear. At operation a low whisper was understood. Audiograms at the time of discharge from the service three months later showed an average loss of 25 d. by air for the speech frequencies.

Case 13: F. H., white female, 27-year-old wife of naval officer, had first noted hearing loss two years before admission. Preoperative audiograms revealed an average loss of 56.6 db. by air and of 21.6 db. by bone for the speech frequencies in the poorer ear. Early postoperative audiograms revealed average losses of 55 db. by air for the speech range, but a month later there was an average loss of 23.3 db. by air for the speech frequencies, indicating an average gain of 33.3 db. for the speech range.

Case 14: J. I., white female, 42-year-old wife of naval officer, had been hard of hearing for seven years when first seen. Preoperative audiograms revealed an average loss of 46.6 db. by air and of 11.6 db. by bone for the speech frequencies in the poorer ear. Postoperative audiograms revealed an average loss of 11.6 db. by air for the speech frequencies at the time of discharge six weeks later. A transient facial paresis responded rapidly to treatment with galvanic stimulation and massage, so that no residuals were visible after three months.

Case 15: R. A., white male, 50-year-old veteran of World War I, had noted hearing loss of mild degree in both ears for several years, but the loss had become much more accentuated after an automobile accident 18 months prior to admission had resulted in serious skeletal injuries leading to a wheel chair existence. Preoperative audiograms revealed an average loss of 53.3 db. by air and of 26.6 db. by bone for the speech frequencies; however, the higher tones of the scale were heard very poorly, and no frequency above 4096 d.v. was heard. Speech reception, on the other hand, was good, with adequate amplification. After much thought and several consultations with other otologists, surgery was recommended in the hope of delaying further progress of the disease and to try to improve hearing to a practical level. A low whisper was heard at two feet on the operating table immediately after the fenestra had been made. Postoperative audiograms revealed an average loss of 36.6 db. by air for the speech frequencies, but the subjective improvement was much more marked than audiometry would indicate, and was sufficiently rehabilitating to the patient to cause him to seek operation on the unoperated ear, so that it could be brought up to the level of the operated ear. Practical serviceable hearing was not obtained, however, and this case must be recorded as a failure.

Case 16: M. J., white female, 24-year-old wife of chief petty officer, U. S. Navy, first noticed hearing loss in both ears at age of 19. Preoperative audiograms revealed an average loss of 48.3 db. by air and of 13.3 db. by bone for the speech frequencies in the poorer ear. Postoperative audiograms revealed an average loss of 40 db. by air for the speech frequencies at discharge three weeks later; however, 18 months later, audiograms revealed an average loss of 33.3 db. by air for the speech frequencies in the operated ear. The 2048 frequency at this time showed a loss of only 25 db., and ordinary conversation was well understood. This case represented a delayed response to surgery that could possibly be explained on a psychogenic basis. At the time of her operation she was in poor spirits because of marital difficulties. A year after surgery, however, she had divorced her husband, and six months later, when her hearing was retested she had acquired a new younger mate, and her outlook on life was much more optimistic. Whether or not this had any effect on the audiogram is a matter of opinion.

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Case 17: M. H., white male, 30-year-old veteran of World War II, had first noted hearing loss and tinnitus at age 25. Preoperative audiograms revealed an average loss of 46.6 db. by air and of 20 db. by bone for the speech frequencies. Although good reception of whisper was obtained at operation, subsequent audiograms were never encouraging, and the average loss at the time of discharge from the hospital was 41.6 db. by air for the speech range. A revision on this ear was performed six months later, and the fenestra was found to be completely occluded by fibrous tissues. A new fenestra was created posterior to the occluded one, on the external semicircular canal, and the flap was replaced, but no improvement was obtained postoperatively.

Case 18: L. M., white male, 27-year-old dental officer, U. S. Navy, had first noted hearing loss in both ears seven years prior to surgery. The left ear had been successfully fenestrated in 1943, and had maintained a satisfactory hearing gain. The right ear revealed an average loss of 43.3 db. by air and of 8.3 db. by bone for the speech frequencies. At operation a low whisper was well understood. Postoperative audiograms revealed an average loss of 21.6 db. by air for the speech frequencies in the right ear at the time of discharge three weeks postoperatively.

Case 19: L. B., white male, 25-year-old veteran of World War II, had first noticed hearing loss and tinnitus in both ears about four years prior to admission. Preoperative audiograms revealed an average loss of 46.6 db. by air and of 15 db. by bone for the speech frequencies. Postoperative audiograms revealed an average loss of 21.6 db. by air for the same frequencies. The apparent rehabilitation in this patient was very gratifying.

Case 20: E. O., white female, 32-year-old army nurse, first noted hearing loss four years before admission. Preoperative audiograms revealed an average loss of 45 db. by air and of 13.3 db. by bone for the speech frequencies in the poorer ear, but speech reception was much worse than audiometry indicated. At operation low whisper was well understood, and postoperative audiograms revealed an average loss of 11.6 db. for the speech range at the time of discharge.

Case 21: R. H., white male, 23-year-old veteran of World War II, first noticed bilateral hearing loss at age 20. Preoperative audiograms revealed an average loss of 51.6 db. by air and of 15 db. by bone for the speech frequencies. Postoperative audiograms revealed an average loss of 11.6 db. by air for the speech range in the operated ear at the time of discharge.

Case 22: A. E., white female, 32-year-old dependent wife of naval officer, first noticed hearing loss at about age 27. Preoperative audiograms revealed an average loss of 50 db. by air and of 13.3 db. by bone for the speech frequencies. A low whisper was understood on the operating table and postoperative audiograms at the time of discharge revealed an average loss of 16.6 db. by air for the speech frequencies.

Case 23: N. A., white male, 38-year-old veteran of World War II, first noted hearing loss in both ears about 10 years prior to admission. Preoperative audiograms revealed an average loss of 5 db. by air and of 28.3 db. by bone for the speech frequencies in the poorer ear. Postoperative audiograms revealed an average loss of 20 db. by air for the speech frequencies.

Case 24: J. P., white male, 37-year-old veteran of World War II, had first noted hearing loss five years prior to admission. Preoperative audiograms revealed an average loss of 55 db. by air and of 11.6 db. by bone in the poorer ear. A low whisper was heard on the operating table, but postoperative audiograms failed to reveal any practical improvement, and at discharge three months later the average loss for the speech frequencies was 46.6 db.

Case 25: K. T., white female, 33-year-old wife of chief petty officer, U. S. Navy, first noted hearing loss following pregnancy four months prior to admission. Preoperative audiograms, frequently repeated, showed an average loss of 46.6 db. by air and of 18.3 db. by bone for the speech frequencies in the left ear, and losses of 36.6 db. by air and of 25 db. by bone in the right ear. The left ear was chosen for operation because of its better bone conduction. Speech perception tests were relatively poorer than audiometry would indicate. The patient was very anxious for surgery, and had been recommended for fenestration by qualified otologists elsewhere. At operation a low whisper was well understood, and postoperative audiograms at first were very encouraging; however, at the time of discharge six weeks postoperatively, the audiograms revealed an average loss of 60 db. for the speech frequencies in the operated ear. This patient was followed very carefully. She was convinced that her hearing would return, and continued to visit her consulting otologist at Duke University, Durham, N. C. Amazingly enough, repeated audiograms revealed a gradual improvement in the unoperated right ear but no improvement in the operated left ear. An audiogram taken seven months later revealed an average loss of 16.6 db. by air in the right ear, and of 66.6 db. by air in the left ear for the speech frequencies. These relative values still exist, and bone conduction in the unoperated ear is now less than air. The only explanation offered for the bizarre audiometric findings in this case is that the hearing loss was on a psychogenic basis, and that repeated preoperative hearing tests allowed the patient to give the responses which she knew would lead to surgery. She had become convinced that surgery would be her salvation before coming to Bethesda.

If the criteria for successful fenestration surgery which have been emphasized so frequently by Lempert and Meltzer are applied, namely, the return of useful serviceable hearing for ordinary group conversation, lectures and the theatre, our results in the early cases were not very impressive. Sixteen cases had a return of serviceable hearing and nine cases did not, giving an average of 64 per cent successful cases. Follow-up on these cases is being continued wherever practicable.

It is not my intent in this presentation to compare our results obtained in one naval hospital with those obtained elsewhere but rather to offer the experiences of an average otologist with his first few cases of surgical otosclerosis. Some of our unsuccessful cases are worth emphasizing, since it is apparent to us that more intensive preoperative study would have enabled us to realize that operation was not indicated.

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In Case 25, for example, psychiatric evaluation, possibly aided by an interview under hypnosis, might have been able to uncover the true status of the hearing loss, so that surgery could be eliminated. If Case 16 were to be seen for the first time today, we would find out much more about her marital, economic and social background before recommending surgery, and we would probably defer our final decision as to her suitability for surgery, regardless of our audiometric findings, until she had made a more satisfactory readjustment to her environment. If her audiologic evaluation was then satisfactory for surgery, fenestration would be recommended. It is our feeling that no one who is emotionally unstable or depressed can have his hearing status satisfactorily determined. In Case 15, the evidence of nerve degeneration pre-operatively should have been more critically evaluated before surgery was recommended. It is true that his postoperative hearing level was satisfactory subjectively, but according to the audiometer, which is the best unbiased yardstick we have today, the patient was still clinically deaf. In Case 6, the poor bone conduction for the 2048 frequency should have indicated a much poorer prognosis than it suggested at the time.

It is our hope that the lessons to be learned from the above cases will be applied by those who are adding their names to the expanding list of fenestration surgeons. I have had a feeling of admiration and some envy after reading of the excellent results obtained in clinical otosclerosis by the outstanding proponents of the fenestration operation; however, it has been much more instructive for me to review the results obtained in the early cases of such men as Meltzer and Moorehead, whose figures were much less impressive. The unfavorable results obtained in some of their cases caused them to make a critical analysis of their indications and contraindications for surgery. Their conclusions, as outlined by Meltzer at the Academy meeting in 1948, are worth reviewing. It is only by studying the reasons for failure in all unsuccessfully operated cases of clinical otosclerosis that we can hope to eliminate those cases with a very poor prognosis, and can thereby offer

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a higher percentage of good results to the cases which are suitable for surgery. This is especially true for those of us whose total number of cases will necessarily be small.

SUMMARY.

1. A brief account of the origin and development of endaural surgery of the temporal bone is given.

2. A report of a series of 25 cases of clinical otosclerosis treated by fenestration of the external semicircular canal is presented.

3. The lessons to be learned from the early experiences of an average otologist taking up fenestration surgery are offered to those who are about to enter this field of operative otology, with the hope that it will help them in the selection of their cases for surgery.

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CHRONIC SECRETORY OTITIS MEDIA.*

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The purpose of this paper is to discuss the etiology, signs, symptoms, pathology and treatment of chronic secretory otitis media. This discussion is based on 123 private patients seen in the past two years. A clarification of terminology will be made. The use of radium for this condition is analyzed and a report of irradiation of the nasopharynx is given.

Secretory otitis media is now an accepted term for a definite clinical entity. Terms frequently seen in recent literature are: otitis media with effusion and catarrhal otitis media. Earlier the condition was designated as seromucus middle ear catarrh, exudative middle ear catarrh, serous otitis media, hydrotympanum, secretory middle ear catarrh, secretory transudative noninflammatory middle ear disease and secretory exudative otitis media. The condition is not new, having been described by Politzer¹⁰ in 1869. Increased public interest in hearing problems and routine hearing examinations in the public schools probably account for the apparent increase in the number of these cases.

The paper will not deal with aerotitis or with acute or sub-acute secretory otitis of short duration, frequently seen associated with an acute upper respiratory infection. In both conditions the etiology is apparent and response to inflations and paracentesis, if indicated, brings rapid and permanent relief. Mucus otitis media, in which the Eustachian tube is apparently patent and the middle ear exudate gelatinous in consistency, is not included in this discussion.

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The cases used in this paper were all seen as private patients and were recorded as the diagnosis was made. The age groups were as follows: 75 were in the one to 10-year group, 22 were between 11 and 20 years old and 26 were over 21 years of age.

The pathogenesis is apparently a closure of the Eustachian tube, preventing proper ventilation of the middle ear cavity. The lack of ventilation results in absorption of the remaining air in the middle ear cavity, creating a partial vacuum. This vacuum is replaced, or partially replaced, by a transudation or exudation. Hantman⁴ states it may be both a transudation and exudation, and Lowry⁹ offers evidence of the transudative nature of the fluid. All agree, including this writer, that if the Eustachian tube is made patent and remains so, and the fluid is evacuated either by nature or mechanically, the middle ear remains clear of fluid. The cause of the closure of the Eustachian tube is then the important factor in the condition.

The primary etiologic factors of this group of cases were found to be as follows: 91 cases, or 73.98 per cent, were due to allergy, nasopharyngeal adhesions and chronic infection were found in 28 cases, or 22.76 per cent, and four cases, or 3.25 per cent, were attributed to diseased adenoids.

The diagnosis of allergy was made by nasal smears, skin testing and response to allergic therapy. A trial period of antihistaminics was very helpful in establishing the diagnosis. It was possible to get positive nasal smears in the majority of this group by repeated observations. The proof of allergy as a predominant etiologic factor was demonstrated in all but three of these 91 cases by cessation of symptoms after proper allergic management. Further proof was frequently seen in the allergic patient who prematurely discontinued treatment, only to have fluid reappear in the middle ears and to be relieved again after resumption of allergic care. The three cases mentioned above are still under treatment and have not at this date been controlled. Lewis⁸ reports six cases of secretory otitis media, all of which gave allergic histories. Proetz¹¹

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reports several cases of secretory otitis media following allergy. He describes a case of a 15-month-old child who had secretory otitis media with each attack of asthma.

Nasopharyngeal adhesions along the lateral pharyngeal bands causing distortion of the pharyngeal orifice of the Eustachian tube with decreased patency was the next most common cause. Infected lymphoid tissue of the nasopharynx was the third etiologic factor found. Since, as Robison¹³ states, "The pharyngeal orifice of the Eustachian tube shares in the inflammatory reaction of the nasopharyngeal tissue," this can cause closure of the tube. It was not always possible to differentiate between chronic adhesions and chronic infection, since in many of the remaining cases it was coincidental; therefore, the 28 remaining cases were considered as one group.

The rôle that diseased or hypertrophied tonsils and adenoids plays in this condition seems minor. Of the 94 cases in this series which had tonsils and adenoids removed, 18 were done after being seen in the office. Ten of these cases were allergic and had recurrence of the secretory otitis media, which did not subside until after the allergy was controlled. Four of the remaining eight cases required further nasopharyngeal treatment, and four remained clear after tonsillectomy and adenoidectomy. It is interesting to note that of 804 cases of secretory otitis media reported by Hoople⁷ and Blaisdale, only 50 cases were attributed to diseased tonsils.

A consistent finding in this group of cases was the marked hypertrophy of the tonsils and adenoids in the allergic child. In the allergic patient the recurrent adenoids were always much larger than in the nonallergic patient. Two cases had chronic suppurative maxillary sinusitis, but no improvement was obtained after clearing the infected sinuses, and improvement occurred only after control of the existing allergy. The other etiologic factors listed in the report of Hoople and Blaisdale were not encountered.

The etiologic factor proposed by Robison, of pressure on, or displacement of, the lumen of the tube by a nasopharyngeal

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lymph node in the region the tube traverses could not be determined.

The symptomatology found in this group of cases coincided with the literature. The unsolicited chief complaints were as follows: 77 cases were brought to the office because of suspected hearing loss. The hearing loss was usually mild in children and more severe in adults, as illustrated by Charts 1 and 2. Frequent attacks of earache was the history obtained

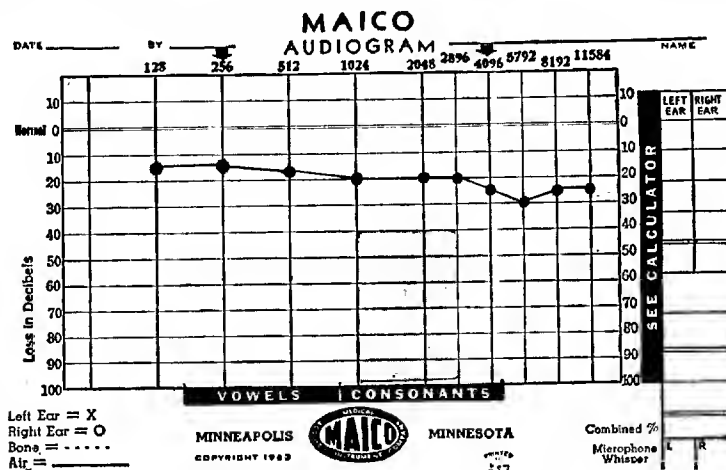


Chart 1. Average hearing loss for age group, five to 15 years.

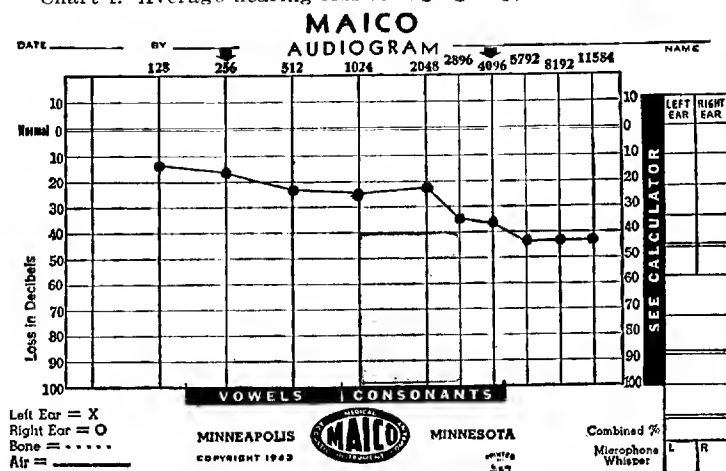


Chart 2. Average hearing loss for age group over 15 years.

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in 16 cases. Fourteen cases complained of frequent colds. Aural stuffiness was noted in 10 cases. A varying type of tinnitus, commonly a low-pitched buzzing, was the chief complaint in six cases. All the above symptoms occurred in many of these cases, although stuffiness and tinnitus were more common in the group over 21. Less common but definitely diagnostic symptoms were the complaints of splashing in the ear on motion and fluctuation of hearing with change of position of the head. The duration of the symptoms in this group was from one week to 30 years. A past history of aural discharge was found in 42 cases; of these, 30 were allergic.

The most constant physical sign in this group of cases was a yellowish red cast of the drum seen in a slightly retracted position. No inward motion could be produced by a Siegel otoscope, but occasionally a slight outward or lateral motion of the drum occurs with suction. The drums were also seen to be in the normal position and rarely slightly bulging. The color of the drumhead was sometimes a bluish red, especially in those cases in which the drum was slightly bulging. A fluid level or air bubbles were rarely seen initially, but commonly seen in the middle ear cavity after inflation. A positive means of diagnosis is a simple paracentesis without anesthesia, followed by inflation and spot suction. The procedure results in forcing straw-colored fluid through the paracentesis and clearing the middle ear. The tympanum then appears normal in color and position. In those cases in which the drumhead was relatively transparent, the hyperemia and edema of the mucosa of the inner wall of the middle ear cavity was quite apparent. In many cases following paracentesis, air could be seen entering the middle ear cavity, indicating incomplete relief of the vacuum created in the middle ear. Another observation in these cases following paracentesis was a slow filling of the middle ear after initial evacuation by tilting the head slightly forward. No actual measurement was made of the fluid recovered from the middle ear cavity, but an estimation would place the amount from 0.1 to 2 cc. Direct smears of the fluid recovered revealed no bacteria; there were some scattered polymorphonuclear leucocytes and occasional eosinophiles.

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Early in the study of this group the treatment was somewhat standardized: Local treatment to the nose and throat was prescribed as indicated, Eustachian tubal inflations following simple paracentesis of the tympanic membrane were done in older children and adults; the younger children were Politzerized; if the tonsils and adenoids were present, these were removed. Eighteen tonsillectomies and adenoidectomies were done after the diagnosis of secretory otitis media was made. All but four had recurrence of symptoms, the time varying from no change in the aural findings to one year's relief. If the adenoids and tonsils had been removed prior to being seen in the office, secondary adenoidectomy and/or radiation was performed. Careful secondary adenoidectomies were done, with emphasis upon manual removal of adhesions along the lateral pharyngeal bands. Radiation therapy was done after the technique described by Crowe. A standard monel metal radium applicator made by the Radium Chemical Co. for this purpose was used. The average number of radiations was two, the largest number, eight. Sixty-six cases were treated in the following manner: 11 cases had secondary adenoidectomies; 33 cases had secondary adenoidectomies and radiation therapy, and 22 cases were treated with radium alone. Of these 66 cases, 35 had recurrence of symptoms, ranging from two weeks to 14 months. The largest number of recurrences occurred two months after the last treatment. This relatively high percentage of recurrences stimulated further search for the cause. With a more thorough history, repeated nasal smears and trial periods on antihistaminic medication, 34 of these cases were found to be allergic. None of the 34 cases which recurred received less than three radiations, and one case eight radiations. Another case received five X-ray treatments and three radiations.

Because of the indefinite results obtained in radiated cases, some experimental work was tried to determine the effect of radium on lymphoid tissue. Twenty-nine children between the ages of five and 13 scheduled for routine tonsillectomies and adenoidectomies were used. The adenoids of these patients were radiated with the standard radium applicator and then

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removed and sectioned. To prevent errors due to a faulty applicator, the technique was uniform and carried out in the following manner: Three standard monel metal radium applicators were used. The applicator was inserted along the floor of the nose until it came in contact with the posterior wall of the nasopharynx. No attempt was made to push the applicator laterally. The same procedure was repeated through the other nasal cavity so that the central mass of adenoid tissue received radiation from both sides. After varying time intervals the adenoids were removed for sectioning. An adenatome to fit the nasopharynx was used and the first mass of adenoid tissue removed was immediately placed in Zenker's solution and sent to the laboratory for sectioning.

The first group of 15 were irradiated for eight and one-half minutes. The number of irradiations varied from one to three and the adenoids were removed at various intervals from one to six weeks after the final irradiation.

The sections were read by Dr. Mathew Block,¹ Department of Hematology, University of Chicago, and Dr. E. E. Heller,² Professor of Pathology, University of Pittsburgh. The following report is a consolidation of their opinions:

Slide No. 2283 from tissue removed three days after one irradiation seemed to show some changes but could not be said definitely to be pure irradiation changes. There seemed to be fewer mitoses than in the controls selected at random. The secondary follicles of the germinal centers contained fewer lymphocytes, making them appear to contain more reticulum cells. The secondary follicles appear also a little smaller than in the controls. Slide No. 2284 from tissue removed three days after one irradiation did not contain any nuclear debris such as is usually visible at an early stage following irradiation, presumably, therefore, it had been cleared up by phagocytosis. The opinion was, therefore, that there were fewer mitoses in the secondary nodules. These nodules seemed to be a little smaller than in the controls. The secondary nodules have fewer lymphocytes and consist mainly of closely packed reticulum cells. There is less nuclear debris, possibly the results of irradiation.

Slide No. 1645, one week after one irradiation, and Slide No. 2068, three weeks after one irradiation, again show mitoses. Regeneration seems to be fairly complete.

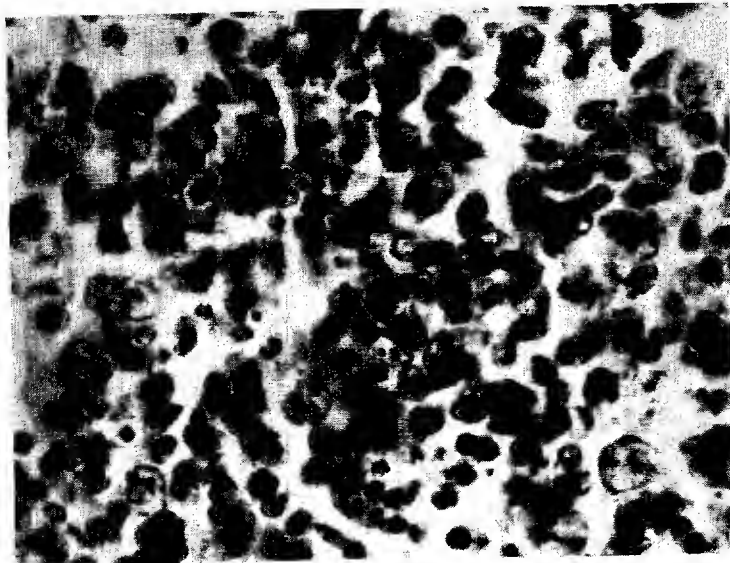
Slide No. 2822, from tissue removed five weeks after two irradiations, Slide No. 2821, removed two weeks after three irradiations, and Slide No. 3144, removed six weeks after three irradiations, cannot be said to show anything definitely abnormal. It is possible that grossly the adenoids might be smaller, but microscopically one would not expect to see a change so long after treatment.

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No microphotographs were made of these sections because of the indefinite findings.

After Crowe³ advocated the change of radiation time from eight and one-half minutes to 12 minutes, the experiment was repeated, using 14 subjects. Similar technique, number of radiations and time intervals were used with the exception that at the suggestion of Dr. Block, sections were also taken 18 hours after one radiation. The sections were again read as above, and the following is a consolidated report of the findings:

The specimens removed 18 hours after beta radiation show degeneration. Large numbers of degenerated lymphocytes are seen in the nodules, as illustrated by photomicrograph S-48-410. No mitoses or other regenera-

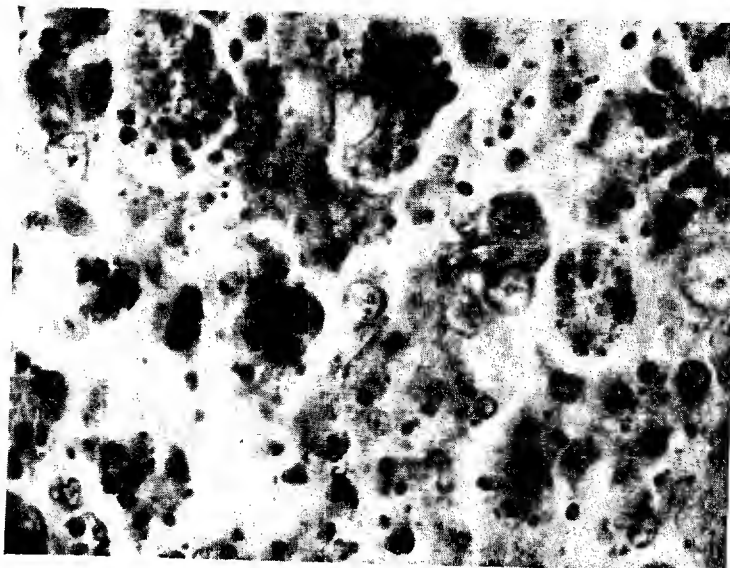


Photomicrograph S-48-410. Degenerated lymphocytes are seen in the nodules.

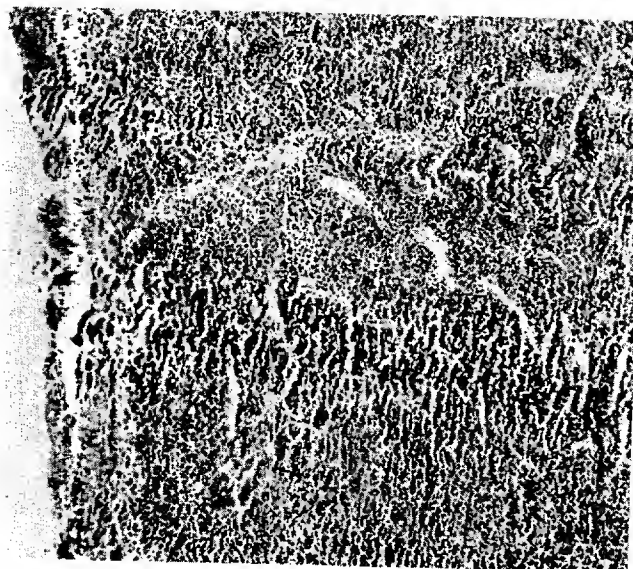
tive processes are seen. Numerous large phagocytes crammed with nuclear debris are seen in the primary follicles as shown in Photomicrograph S-48-650. In one slide (see Photomicrograph S-48-651) the epithelium shows a marked change. The epithelial cells are distended and vacuolated, architecture is disturbed and adjacent lymphocytes are degenerated. This may represent a point of contact with the radium capsule since epithelial tissue in general is very resistant to radiation.

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Photomicrograph S-48-650. Large phagocytes crammed with nuclear debris are seen in the primary follicles.

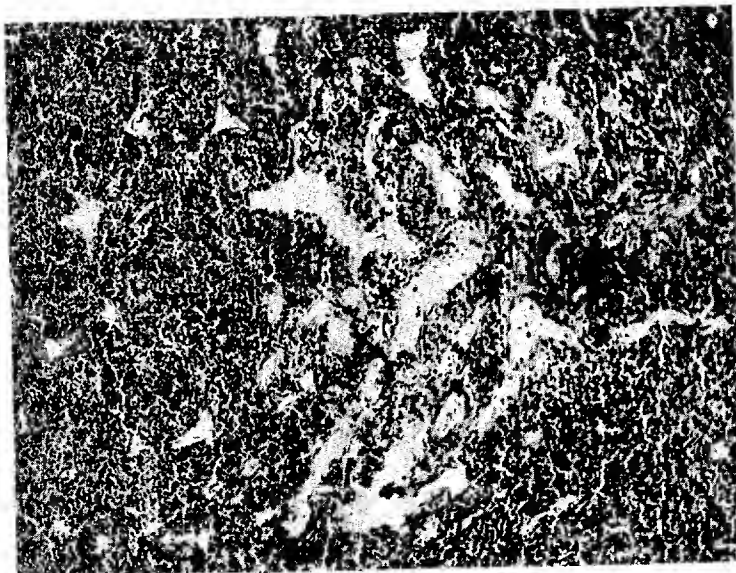


Photomicrograph S-48-651. The epithelium shows a marked change. Probably represents a point of contact with the radium capsule.

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Photomicrograph S-47-4017. Shows monomorphous appearance of the nodules.



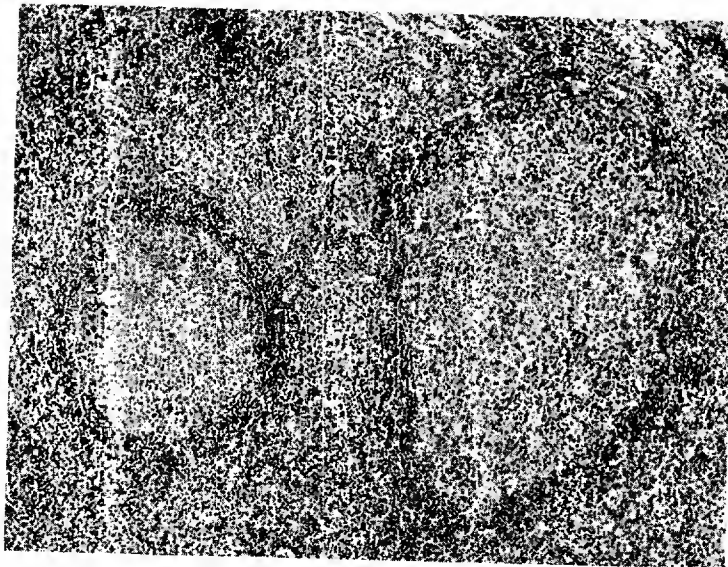
Photomicrograph S-47-4164. The increase in the venous sinusoids and capillaries is shown.

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In the slides of tissue removed 14 days after one irradiation, there is marked regeneration of the lymphoid nodules. Mitotic figures are fairly numerous in most sections of this group. Another section made of tissue irradiated once and removed in 14 days shows the monomorphous appearance of the nodules. This seems consistent when one remembers that medium lymphocytes in this phase of regeneration predominate the picture. Photomicrograph S-47-4017 illustrates this period of regeneration.

In the sections of tissue removed 14 days after two radiations, a mild increase in the number of venous sinusoids and capillaries are noted, as shown in Photomicrograph S-47-4164.

Sections of tissue removed six weeks after three irradiations show active, healthy lymphoid nodules. Many mitotic figures are still seen, however. Photomicrograph S-48-58 is taken of one of these sections of tissue.



Photomicrograph S-48-58. Section of tissue removed six weeks after three irradiations shows active, healthy lymphoid nodules.

Further comments from Dr. Block's report are as follows: "Reticulocytes are not affected by the usual therapeutic doses of irradiation. Their survival deflates complete destruction of lymphoid tissue. It seems quite certain that the medium large lymphocytes develop from these undamaged reticulocytes. They in turn develop into small lymphocytes. These small lymphocytes are pushed to the periphery of the lymphoid

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nodule and end up in the peripheral blood stream. Unless they go into the blood faster than they are produced, they form a ring around the lymphoid nodule. It seems apparent from these slides that 1. radiation reaction in the lymphoid tissue is marked; 2. a stage of atrophy is present; 3. regeneration of the lymphoid tissue is so complete as to appear histologically normal in six to eight weeks. It is not possible to say from these microscopic slides whether any permanent decrease in mass of the lymphoid tissue has taken place. Judging from the histologic picture, one would expect very little permanent change."

The literature contains similar observations as made above. Heineki,⁵ in 1902-1905, described the extreme sensitivity of all lymphoid tissue to irradiation. In 1925, Quick¹² and Cutler published a study of the effect of radiation on lymph nodes. They noted that normal nodes subjected to irradiation enlarged instead of becoming smaller.

The above histologic studies of irradiated adenoids coincide with the clinical findings of initial beneficial effect followed by recurrences. Two-thirds of the cases treated by irradiation were treated for eight and one-half minutes, and the remainder for 12 minutes. No clinical difference was noted in the end-result following irradiations of eight and one-half or of 12 minutes. Of the 55 cases which received irradiation therapy, 28 recurred. All of these cases subsequently proved to be allergic. Of the 11 cases which had secondary adenoidectomies, seven cases recurred and of these six were allergic. Thus in the presence of a chronic stimulation, such as uncontrolled nasal allergy, lymphoid hyperplasia continues, although momentarily delayed by irradiation, surgery or both.

Fifty-seven cases of known allergy were treated primarily by allergic management. All but three of these cases are completely free of fluid in the middle ears. These three cases have not as yet been allergically controlled. Recurrence in this group occurred also, but always followed cessation of allergic treatment or an acute allergic exacerbation. All cases returned to normal when allergic management was again instituted.

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Paracentesis and inflations seem to hasten the recovery of those patients but cannot be considered a curative measure without removing the etiology.

CONCLUSIONS.

Secretory otitis media is a common clinical entity.

The most frequent etiologic factor is nasal allergy.

Other etiologic factors are nasopharyngeal adhesions, chronic infected lymphoid tissue in the nasopharynx and hypertrophied adenoids.

The signs and symptoms are consistent and the hearing loss not great.

The most consistent favorable results in the allergic group occurred with removal of the offending allergen or desensitization.

Removal of nasopharyngeal adhesions and infected lymphoid tissue along with inflations and paracentesis have given good results in the nonallergic cases.

The value of irradiations in this condition for any prolonged effect remains doubtful.

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LINGUAL TONSILS. (A NEW EVALUATION.)*†

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The lingual tonsil has been a much neglected subject. In 25 years of laryngology, I have yet to see a laryngologist remove an honest-to-goodness pair of lingual tonsils at any of the hospitals which I have attended, including two teaching institutions.

It is a subject which has been slighted by laryngologists and glossed over by the authors of books on otolaryngology, and by investigators of the tonsils, Waldeyer's ring and the pharynx.

About six months ago I read an extensive article, in one of the laryngeal journals, describing all the diseases of the throat. In the concluding paragraph, there were two sentences giving vague reference to the lingual tonsils. Apparently the linguals were not important to the investigator.

For a number of years I have put much thought and work on this subject, and I hope to stimulate some interest which may lead to a better understanding of the linguals.

In teaching laryngology to postgraduate students, I often show specimens, preserved in formalin, which are so large that they elicit expressions of amazement.

My own interest in the subject started some years ago, in a laryngeal clinic. An adult male patient, with a severe arthritis of the cervical spine, was sent to the clinic for an

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ear, nose and throat examination. He had tremendously large lingual tonsils which almost filled the hypopharynx, and gave the impression of a tongue tumor. A biopsy showed chronic inflammation of lymphoid tissue. Having resolved that the mass was nonmalignant, the question of removal came up. The various men asked to remove it balked at the idea, as they were afraid of lingual hemorrhage. Never having removed linguals myself, I decided to attempt it, and to my surprise I was able to do a clean operation, without much difficulty, by means of a pair of long, curved scissors and a tonsil snare. The patient had quite a sore throat for about 10 days but made an uneventful recovery. His symptoms of arthritis improved. From this one case, my interest in the subject broadened, and I have followed it up with an extensive series of cases, from which I can make definite deductions.

ANATOMY, HISTOLOGY AND HISTOPATHOLOGY OF THE LINGUAL TONSILS.

The lingual tonsil consists of a variable number of small lymphoid nodules at the base of the tongue, in front of the epiglottis and behind the line of circumvallate papillae or taste buds. The plica triangularis, which is frequently removed at the end of a tonsillectomy, is not the lingual tonsil, as some laryngologists call it. There may be a small mass of lymphoid tissue of variable size where the plica attaches to the tongue, but anatomically this is not a lingual tonsil.

The lymphoid nodules at the base of the tongue and in front of the epiglottis are usually small and inconspicuous. These nodules may hypertrophy and also increase in number, in which case a prominent mass begins to form on each side of the base of the tongue, forming a true pair of lingual tonsils. The lingual tonsils rest on a basement membrane analogous to the capsule of the faucial tonsils. Beneath this basement membrane is the musculature of the tongue.

When sectioned laterally, the nodules appear as discrete hemispheres with narrow intervals between them. Each nodule has two or three crypts, extending from the epithelial

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surface nearly to the capsule, which are dovetailed by several fibrous trabeculae from the capsule. The crypts are not tortuous. The epithelium, like that of the faucial tonsil, is stratified and squamous, and possesses mucous glands. The lymphoid tissue differs in no way from that of the faucial tonsil.

Between the two linguals is a fibrous band of demarcation, which starts just behind the apex point of the circumvallate papillae and goes down to a point just above and in front of the base of the epiglottis. This band is sometimes called the median glossoepiglottic ligament.

Hypertrophy of the linguals is usually compensatory to a faucial tonsillectomy. Most hypertrophies are found in adults. It is most unusual to observe massive hypertrophies of the linguals in the presence of faucial tonsils. Hypertrophies often reach tremendous size. On several occasions, I have removed linguals the size of a large oyster. The greater the hypertrophy the more prominent the fibrous line of demarcation between the two tonsils.

Occasionally a child who has large faucial tonsils will have an associated hypertrophy of the linguals covering the entire base of the tongue, but these cases are not very common.

Sometimes the linguals, in moderate hypertrophies, will creep laterally and form a thick sausage-like band along the lateral edge of the tongue, and fuse either with a lower pole tonsil stump, or the lower pole of a full faucial tonsil.

The lingual tonsils are subject to the same diseases as the faucial tonsils, such as acute and chronic inflammations, hypertrophies, benign and malignant tumors, abscesses, varices, specific ulcers (tuberculosis and syphilis), Vincent's infections, mycotic infections, etc.

SYMPTOMS.

The average person with the small discrete lymphoid colonies at the base of the tongue, which really cannot be classified as true lingual tonsils, rarely has trouble with his throat and has little occasion to seek medical care.

On the other hand, the individual with moderately enlarged colonies, forming two distinct masses, and the individual with the huge hypertrophies, usually runs into a lot of trouble with throat complaints and often seeks medical care. His infected linguals are usually missed by the family physician because he is not trained in mirror laryngoscopy. The laryngologist often misses them because he is busy or indifferent. If the laryngeal mirror is always used in examining throats, a true picture of the base of the tongue becomes evident.

What are the commonest symptoms of these patients?

1. *Acute Lingual Tonsillitis.* The same symptoms as with faucial tonsils, with the addition that the pain is lower, usually off center, and with sharp pains on swallowing, in the hyothyroid area. This symptom of a stabbing pain low down in the neck is important.

2. *Subacute Lingual Tonsillitis.* Instead of the throat symptoms subsiding in three or four days, the patient's distress may continue three or four weeks.

3. *Chronic Lingual Tonsillitis.* These patients start with an acute lingual tonsillitis, the acuity of the symptoms subsides, but the patient has a dull sore throat that persists for weeks or months. One of the residents in radiology at the Philadelphia General Hospital had a sore throat for 11 months. A year ago, I destroyed his linguals by electrocoagulation and he has not had a single sore throat since.

The patient with chronic lingual tonsillitis is really throat conscious and always has a dull ache and lumpy feeling when he swallows. Some of the patients with large hypertrophies may have difficulty in swallowing food, or may have difficulty in swallowing liquids. Some have no difficulty along these lines. They have used all the gargles and medicaments prescribed by physicians and druggists, and will go on for months or years with their complaints unless the causative pathology is discovered and treated. Even the acute and subacute cases complain bitterly of repeated attacks of sore throats year

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after year. Some of the patients complain of frequent spells of hoarseness, and one can readily see how the laryngeal area is involved.

In my collection of lingual tonsils, there are those removed from the throats of two stenographers, who, for 10 years in one case, and four years in the other, had repeated sore throats of long duration. Besides being ill, they were always worried about losing their positions, due to the time lost from their offices. These two patients vouched for one thing — laryngeal mirrors were never used in any of their previous throat examinations. Such patients feel miserable and deserve our help.

In simple hypertrophies, with a low grade infection, the patient may complain of a feeling of fullness in the throat, and may have a hacking cough for years. Patients with dry, irritative coughs are often treated for years by the internist, who always suspects incipient tuberculosis, or chronic bronchitis of unknown etiology, or an early bronchiectasis. They are studied in hospitals, X-rayed and treated, but the cough remains.

Early malignancies are sometimes found in patients who complain of severe pain on one side of the throat. In these cases, the surface of a lingual tonsil will show a fissured or an ulcerated area, with a piling up of wart-like tissue around it. The tongue should also be palpated with the finger in cases where malignancy is suspected. A biopsy will usually make the diagnosis.

Bleeding in patients with hemoptysis often results from ruptured varices at the base of the tongue, with or without the presence of lingual tonsils. These hemorrhages may be mild or severe. They are terrifying to the patient, and in all cases where lungs and esophageal varices can be ruled out, one should examine the base of the tongue for enlarged or ruptured varices.

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TREATMENT.

1. In acute inflammations treat with sulfadiazine or penicillin, just as though you were treating faucial tonsillitis; also any other systemic treatment which you may deem necessary. Advise patient of the presence of infected lingual tonsils and recommend the destruction of this tissue.

2. In chronically inflamed and hypertrophied tonsils, there should be no medical treatment. If the linguals are slightly enlarged, I recommend electrocoagulation; if huge, surgical dissection.

TECHNIQUE OF ELECTROCOAGULATION.

The pharynx and posterior portion of the tongue are surface anesthetized with 10 per cent cocaine solution. Ten cc. of 1 per cent procaine epinephrine solution are then injected into the tongue, 5 cc. on each side, just in front of the lingual tonsils. Wait about five minutes or until the anesthesia has become effective, then start to electrocoagulate the linguals.

I prefer a bipolar needle attached to long or short wave current; the long wave is a little smoother. This procedure is better than electrocoagulation with a monopolar needle. I sometimes use the latter at hospitals where the machine has no provision for bipolar connections.

In using a bipolar needle, the needle is sunk into the tissue about one-sixteenth of an inch, the current is controlled with a foot switch, and the needle is moved to different spots on the tongue, until the entire base is coagulated.

For those who do not own a short or long wave machine, the older type of galvanocautery may be used by bending a cautery tip, using a dull red heat on the needle point. The galvanocautery produces more of a charring "cook" than does the long or short wave currents, and the depth of the coagulation cannot be controlled too well; also, where galvanocautery is used, the patients complain of more distress on swallowing postoperatively. In general, this is a poor technique.

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In carrying out the procedure of coagulation, all of the linguals are destroyed at one sitting. In the past, I have tried the technique of partial coagulation each week but found is unsatisfactory. Instead of a sore throat each week over a number of weeks, one good sore throat for several days seems to be preferable. If the coagulation is done carefully and the musculature of the tongue is not "cooked," the postoperative soreness is tolerable in most cases.

The technique of handling the large hypertrophies is the procedure which I wish to emphasize. In the past, an instrument known as Myles' lingual tonsillotome was introduced and laryngologists would snip pieces of lingual tonsils with this instrument. The technique was comparable to the old and early technique of tonsillotomy — cutting off the top of the tonsil. This method of using the Myles instrument is to be condemned for two reasons:

1. It is incomplete and, therefore, a waste of time.
2. It may induce profuse bleeding, as in tonsillectomy. The cut blood vessels within the lymphoid tissue have no fibrous or muscle tissue to contract down on the cut ends of the small blood vessels.

A lingual tonsillectomy, like any surgical operation, should be based on sound principles.

The tongue tonsils are fairly tough tissue, the basement membrane is tough, and the linguals in the huge hypertrophies extend practically to the base of the epiglottis and are large in size. I cannot see how the Myles lingual tonsillotome, just from a mechanical point of view, could do a complete and smooth operation.

The armamentarium of lingual tonsillectomy is simple and consists of four instruments:

1. A Kirkpatrick tonsil tenaculum with *small teeth*.
2. One Tyding tonsil snare.
3. One stainless steel Metzenbaum scissors.
4. One laryngeal mirror.

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The tongue is anesthetized as for coagulation — 10 per cent cocaine swabbing and injection of 10 cc. of 1 per cent procaine epinephrine into the tongue.

The tip of the tongue is grasped with a gauze square and drawn forward. The left lingual tonsil is grasped with the tenaculum and the nurse or assistant then grasps the tongue, and also holds a laryngeal mirror under the uvula and soft palate. The operator shifts the tenaculum to the left hand and begins to cut with the long, heavy, curved scissors, starting anteriorly at the circumvallate papillae. The line of dissection should be between the musculature of the tongue and the fibrous capsule of the lingual tonsil. The latter separates readily from the tongue. The dissection is followed down as far as possible toward the base of the epiglottis. The Tyding snare is then slipped over the posterior attachment of the lingual tonsil, the instrument is closed firmly and the tonsil is thus removed.

This procedure is repeated on the opposite side. Sometimes in certain cooperative patients it is not even necessary to use the snare, as the scissors will often take off the posterior attachment without any trouble. If the snare is used, press the wire flat against the attached end of the tonsil and close gently but firmly. In this fashion, you cannot injure the epiglottis.

The laryngeal mirror has to be removed a few times during the operation to be cleansed and warmed. Occasionally, if the hypertrophy is extensive, enough of the tonsil is visible at all times to enable the operator to dispense with the mirror.

In some of the cases, the linguals have to be removed piecemeal, as the patient may not be cooperative, or the linguals may be very adherent from chronic infection, just as in faucial tonsils, where the latter have to be removed in pieces.

If small tags of lymphoid tissue remain after the operation, they are coagulated with the electric needle to complete the operation.

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At the time of operation, there is no undue bleeding if you allow five to seven minutes between the injection of procaine and the beginning of the operation.

Postoperatively, the bleeding is usually negligible. Laryngologists in the past have been loath to operate on the base of the tongue for fear of the old "bugbear," severe hemorrhage. My experience has been that patients with lingual tonsillectomies bleed less postoperatively than do patients with faucial tonsillectomies.

I have had but one patient with an actual hemorrhage following lingual tonsillectomy which required suturing about six hours after the operation. The bleeding was at the edge of the tongue, where I had severed scarred and retracted faucial pillars and a faucial tonsil stump attached to the lingual. Two other patients have had slight oozes which were easily controlled with mild astringents; therefore, I may safely advise proceeding with lingual tonsillectomies, using the methods I have described, without fear of unusual bleeding, either during or after the operation.

In patients having hemoptysis which you think is due to lingual varices, coagulate the varix with a bipolar needle or one of the other coagulating needles described. If the varices are associated with hypertrophied linguals, it is advisable to destroy or remove the linguals.

Malignancies at the base of the tongue are treated like malignancies elsewhere in the pharynx.

There is one anomalous condition which the operator must be careful in diagnosing, and that is the aberrant thyroid, which is usually located at the base of the tongue directly in the center. An aberrant thyroid is really a misplaced thyroid, is present at birth, and may increase in size with the growth of the child. It is a hard, smooth, elevated mass, like a small egg, and is not made up like the grouping of discrete lymphoid nodules in the linguals. The accidental excision of an aberrant thyroid may turn the individual into a victim of hypothyroidism.

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Another pathological process which may strike the lingual tonsil is a lingual quinsy or abscess. These are indeed rare, and if they should occur would require incision and drainage.

CONCLUSION.

1. Always use a laryngeal mirror in examining new patients. Ninety-eight per cent of hypertrophied or diseased linguals will not be seen unless a mirror is used.
2. Hypertrophied and diseased lingual tonsils should always be destroyed.
3. Use coagulation if linguals are not large enough to be grasped with a tenaculum; and surgery, if large enough.
4. The two procedures are not painful if the tongue is properly infiltrated with a local anesthetic.
5. The bleeding during operations is usually negligible.
6. Postoperative bleeding is usually less than after faucial tonsillectomy and certainly no worse.
7. Sense of taste may be impaired for a short time in a few cases, then returns.
8. The patients are very grateful, many having suffered over long periods of time with all kinds of bizarre diagnoses.
9. The laryngologist develops a certain sense of satisfaction: first, in making the proper diagnosis; second, in helping the patient.

6330 Lebanon Avenue.

SCLEROMA SIMULATING ATROPHIC RHINITIS.
CLINICAL DIFFERENTIATION AND
LABORATORY CONFIRMATION.*

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Scleroma (rhinoscleroma) in its early stage presents a picture similar to atrophic rhinitis. This fact has been shown by Szmurlo,¹ who has made extensive studies of the disease, and by Putschkowsky,² as described in Eggston and Wolff.³

That early cases of scleroma may be diagnosed and treated as atrophic rhinitis occurred to us while treating a series of three cases of scleroma at the Los Angeles County Hospital.

Clinically, we are all familiar with the atrophic nose. These patients usually have a broad, flat nose with large nasal cavities and small turbinated bones. The nares are usually filled with crusts and a foul, green, purulent discharge, and when the nose is cleaned of its crusts and discharge the large cavernous nasal cavity is seen. In scleroma the crusting and foul smelling discharge is very much like that seen in atrophic rhinitis; but here is where the similarity ceases, for, upon removal of the crusts and purulent secretion, the nasal cavities, instead of being large, are usually narrowed and the mucosa is reddened, giving one the impression of its being infiltrated with a hard, firm substance. When the tissue is palpated with an instrument this impression is confirmed.

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This is the essential clinical finding. It is the responsibility of the examining physician to rule out scleroma. The final diagnosis is based on pathological and bacteriological findings and, if available, a complement fixation reaction.⁴

In obtaining the biopsy it is important to examine the nose well and choose an area that appears infiltrated and, if possible, a nodule or granulomatous area is preferred.

That various stages of the disease may be present in the same individual at the same time was found early in our experience with this disease, and men who have done extensive pathological studies of scleroma state that the disease can be diagnosed best when the stage in which the typical Mikulicz cells, russel bodies, etc., are present, and this is usually the second or the circumscribed stage. When these features are not present, such as may occur in the early or very late stages, repeated biopsies may be indicated; however, a biopsy from a nodule or granulomatous area will most likely give you the typical microscopic picture.

The bacillus of von Frisch or *K. rhinoscleromatis* is the organism thought to be responsible for the disease and is present in the Mikulicz cell. The organism when present will grow very readily on almost any type of media and will overgrow most of the other organisms present. Pearson⁵ believes that the organism is not present in the bacterial flora of the normal nose, as has been stated by some, and when present is definitely pathological.

In obtaining a smear, an ordinary swab of the mucosal surface after the crusts have been removed is usually sufficient. Occasionally we have obtained a positive culture in questionable cases by sending a fresh piece of mucosa to the bacteriology department where the tissue is crushed and a culture made. Because we have obtained at least one or more positive cultures by this method I would recommend that this be done when a positive culture cannot be obtained by direct smear alone.

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Another interesting point about the bacillus of Frisch is that it is unusually sensitive to streptomycin, and there has been at least one report of a cure with streptomycin.⁶ We presented three cases before the Oto-Ophthalmological Section of the Los Angeles County Medical Association, in 1946, which were treated with streptomycin and at least obtained spectacular immediate relief.

We examined all old cases of atrophic rhinitis, and the new cases reporting to the clinic, from the standpoint that they may be scleroma in its early stage. From January, 1946, to January, 1948, 27 cases of atrophic rhinitis were examined, and the routine of biopsy and smear for scleroma was done on all cases, including three cases of atrophic rhinitis following extensive surgery of the nose. The diagnosis of scleroma was considered positive when the pathological report and the culture were both positive. Seven cases met these criteria.

This we realize is a very high percentage, and the fact that most of the patients were Mexicans and that Los Angeles may be an endemic area for the disease has been considered; nevertheless, these findings substantiate the statement made previously in this paper that early cases of scleroma may be mistaken for atrophic rhinitis.

SUMMARY.

1. Early scleroma may simulate atrophic rhinitis, and may be diagnosed and treated as such unless a biopsy and smear are taken for more detailed laboratory examination.
2. The differential diagnosis is extremely important at this time, since there is a drug that is specific for the organism thought to be responsible for the disease of scleroma.
3. As the result of special study, at least seven cases of scleroma were diagnosed in a period of two years at the ear, nose and throat clinic of the Los Angeles County Hospital that would otherwise have been considered atrophic rhinitis.

The author respectfully acknowledges the encouragement in pursuance of this problem and aid in preparation of this paper given by Dr. J. M. Brown and Dr. H. R. Fisher.

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CENTRAL ILLINOIS SOCIETY OF OPHTHALMOLOGY
AND OTOLARYNGOLOGY.

The next meeting of the Central Illinois Society of Ophthalmology and Otolaryngology will be held at the Abraham Lincoln Hotel in Springfield, Ill., on Nov. 18, 19 and 20. Dr. Wm. Benedict, of the Mayo Clinic, will give lectures on: "Cataracts and Systemic Diseases," "General Diseases: Ocular Manifestations" and "Tumors of the Eye and Orbit." Dr. H. P. House, associate professor of otolaryngology at the University of Southern California, will speak on the following: Indications and End-Results of Fenestration Surgery, Management of Otitis Media and Management of the Continually Stuffy Nose. Dr. Walter E. Owen, Peoria, Ill., a member of the Society, will speak on: Drug Therapy in Respiratory Allergy. Dr. Herbert M. Kobes, director of the University of Illinois, Division of Services for Crippled Children, will speak on the "State of Illinois Cooperates with the Ophthalmologist and Otolaryngologist."

**THE TREATMENT OF CHRONIC PURULENT OTITIS
MEDIA WITH GLYCERITE OF HYDROGEN PEROXIDE.**

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In a preliminary report¹ the results achieved in 37 cases of chronic purulent otitis media treated with glycerite of hydrogen peroxide were recorded. Of this original group of patients, 29 responded with completely dry ears. Eleven returned with exacerbations due, in nine, to an acute upper respiratory tract infection, and, in two, following swimming. These were treated as previously with similar satisfactory results. In one patient, in whom a severe exacerbation occurred, a radical mastoidectomy was required. Twelve other patients of the original series have been seen for other complaints and have reported no recurrence of their ear infection since their first course of treatment.

The present paper is concerned with 130 additional cases seen over a period of two years, during which time the limitations and indications for the use of glycerite of hydrogen peroxide have become more clear. It cannot be expected that the solution will cure cases in which there are attic perforations with cellular debris in the mastoid antrum, or when large cholesteatomatous masses are present. Results have not been satisfactory in patients with concomitant Eustachian tube infection, unless these were treated and made free of infection. Otherwise, the results achieved appear worthy of serious consideration.

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The solution used consists of hydrogen peroxide* (1.5 per cent) (derived from urea peroxide, 4 per cent) in anhydrous glycerol, containing as well eight hydxyxyquinoline (0.1 per cent), added for stabilization purposes. The bacterial spectrum of glycerite of hydrogen peroxide with carbamide has been reported upon,² as well as its effect on healing time.³

Method of Treatment.

In each case, the patient was instructed to cleanse the ear mechanically once daily and to instill the glycerite of hydrogen peroxide with carbamide twice to four times daily. The material for culture was taken on the first visit and the patients were seen for examination at varying subsequent periods.

Laboratory Data.

The laboratory data can be summarized as follows: In eight patients, no cultures were taken; of the rest, almost all showed mixed infections. *Staphylococcus, albus* and *aureus*, were reported as present, alone or together in 85 cases. *Proteus mirabilis* was present in 26 patients; and a Gram-negative bacillus was reported in 24. A nonhemolytic streptococcus was cultured from 20 patients. *Esch. coli* from 16; *Ps. pyocyaneus* from 14; diphtheroids from 13, and a hemolytic streptococcus from 10. Ten other organisms were cultured fewer than 10 times each.

Clinical Data.

For the duration of their infection, 50 patients, varying in ages from nine to 60, had stated "since childhood." For the remainder, allowing for approximation and computing weeks to the nearest month, and months to the nearest year, 11 patients had a history of one month's duration; 13 for two months; two for three months; one for four months; six for six months; one for 10 months; three for one year; 10 for two years; six for three years; 12 for five to 10 years, and

*The glycerite of hydrogen peroxide, with carbamide, was supplied, in part, by the International Pharmaceutical Corp., Boston, Mass.

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15 for 10 to 25 years. Almost all the patients presenting years of symptoms had had some previous treatment with little or temporary effect, and some therapeutic as well as spontaneous remissions of varying duration.

All ages were represented, with 24 patients under the age of 10; and for each successive decade, 10 to 19, 27 patients; 20 to 29, 32 patients; 30 to 39, 18 patients; 40 to 49, 19 patients; 50 to 59, eight patients, and above 60, two patients.

Clinical Results.

Since each of the detailed protocols for the entire series cannot be presented individually, the results can be summarized in four categories: the patients in whom the treatment failed; those in whom auxiliary medical or surgical treatment was necessary; those still under treatment and apparently improving; and those in whom the treatment was completely successful.

In all, 14 patients failed to return for further observation. Although some were markedly improved during the period of treatment, none can be used for statistical purposes, since there may have been others who showed no improvement with the topical application prescribed.

Complete failure is reported in five patients, and partial failure in two more. One of the five took treatment regularly for three months for a condition of four months' duration; and a second (age 19) attended irregularly for six months for an infection present since infancy. A third patient presented an infection of 16 years' duration, the culture demonstrating Gram-negative bacilli and proteus mirabilis. There was no change in culture and no response to treatment over a period of more than two months.

A fourth patient (age 18), with an infection present since childhood, with polypi and a chronic sclerotic mastoid, refused surgery and has continued treatment to no avail. The fifth patient (aged 24), with an infection also present since childhood, with large cholesteatomata (revealed by X-ray), also refused surgical interference. Although with treatment the

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drainage was less and the odor diminished, the discharge was, nevertheless, present, although under active treatment. The sixth patient presents a slight persistent drainage, and the seventh, who had had coronary disease and cannot undergo surgery, keeps the discharge and fetid odor under control with daily applications of glycerite of hydrogen peroxide. The latter two patients are considered as partial failures in treatment.

There were 12 patients who required exceptional treatment. Of these, a recurrence, following cessation of drainage, occurred in four. In one, the discharge had been present for two years; and in three others, since childhood. The first and second patients in this group ceased treatment for approximately nine months and then suffered from recurrences, which, however, cleared completely with four weeks of treatment. The third patient had a recurrence in four months. Remissions followed one month of treatment. The fourth had a recurrence, both in nine months and 11 months, following the initial remission, clearing each time and remaining free of discharge from December, 1947, to date (June, 1948).

In the eight additional patients of this group who required auxiliary treatment, three represented infections present since childhood; one (age 32) for "many years"; three, respectively, for six, 10 and 25 years, and one for only five weeks. Of these, one required a polypectomy and after improving for one month of treatment did not return for three months, at which time the discharge was heavy and associated with unilateral pain and cerebral symptoms requiring a mastoidectomy and treatment for a temporal brain abscess. Treatment with glycerite of hydrogen peroxide with carbamide was continued for five months from the date of the first visit. The ear was reported as dry.

The second required removal, first of a polyp, and then of a cholesteatoma. He returned six months later, at which time a radical mastoidectomy was done. Glycerite of hydrogen peroxide with carbamide was continued for nine months from the date of the first visit; the ear was reported as dry. The

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third patient in this group followed a similar pattern, requiring polypectomy, removal of a cholesteatoma and then a mastoid over a period of two months. Freedom from infection was reported in July, with a recurrence during the following February (1947). In March, the ear was dry and has since remained so, more than one year following the initial visit.

The conditions of the fourth and fifth patients were associated with an acute mastoiditis requiring intramuscular penicillin, oral sulfonamides and local glycerite of hydrogen peroxide with carbamide for three weeks and one month, respectively, before complete remission occurred. One other patient required penicillin as well as glycerite of hydrogen peroxide with carbamide; a seventh was treated for a concomitant purulent right antrum and an allergic rhinitis. The last patient in this group needed radical mastoidectomy for a large cholesteatoma. He was discharged in complete remission, but returned with a large infected mass in the old mastoid cavity. Removal and local treatment for a *Staphylococcus albus* infection was necessary for 15 days before the condition completely cleared.

Three patients still under treatment are showing improvement with slight discharge present but diminishing.

The remaining 94 patients, of whom eight had bilateral infected ears, all completely cleared with topical application of glycerite of hydrogen peroxide with carbamide as described above. In five, the treatment period was one week; for 30, two weeks; for 24, three weeks; for 16, four weeks; for four, five weeks; for one, six weeks; for four, seven weeks; and for six, eight weeks. Two patients required 10 weeks of treatment and one patient, 12, and another, 16 weeks of continuous application. Of the 94 patients, however, 75 were in complete remission by the end of the fourth week.

SUMMARY.

In summary, 130 patients were seen presenting conditions diagnosed as chronic purulent otitis media. Of these, 14 failed to return; 12 required auxiliary medical or surgical treatment

W. OWEN: CHRONIC PURULENT OTITIS MEDIA. 1035

for recurrences of concomitant conditions before their infection completely cleared. Of these, four required more than one course of treatment. In five, the treatment completely failed. In two others, there is little remaining persistent discharge. Three patients still under treatment are showing improvement. In the remaining 94, there were complete remissions for treatment periods varying from one to 16 weeks; 75 of the patients presenting dry ears in four weeks of topical application of glycerite of hydrogen peroxide with carbamide.

In all, adding those who required one course of treatment (94) to those who needed two or more courses (four), with the eight in whom surgical or supplementary medical treatment was necessary, a total of 106 patients, of the 116 adequately treated, presented remissions of their purulent otitis media. All were treated with glycerite of hydrogen peroxide with carbamide and in none was there evidence of toxicity, sensitivity or irritation

REFERENCES.

1. BROWN, ETHAN ALLAN; OWEN, WALTER E.: Treatment of Chronic Purulent Otitis Media with Glycerite of Hydrogen Peroxide (A Preliminary Report). *Arch. Otolaryngol.*, 43:605-612, 1946.
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3. JENKINS, JAMES T.: Effect of Glycerite of Hydrogen Peroxide Upon Healing Time in Anorectal Surgery. *Amer. Jour. Surg.*, 54:4:428, 430, Oct., 1947.

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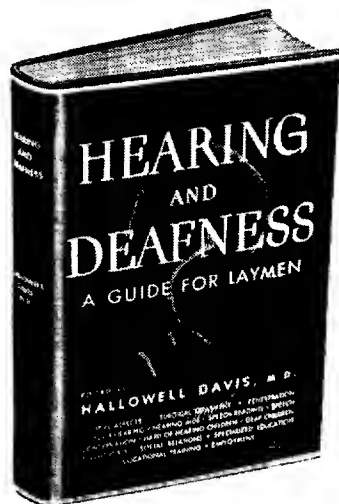
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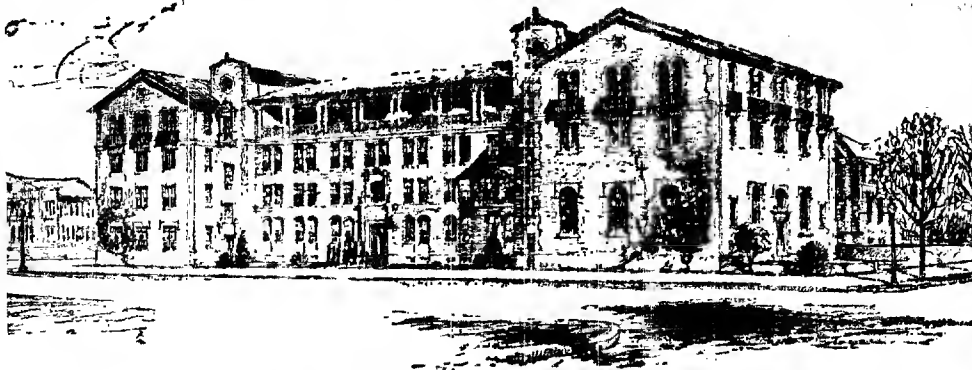
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